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TOOL-ROOM PRECISION ON A MASS PRODUCTION BASIS

Tolerances in Tenths and Split Tenths are Regular Specifications in a New England Shop that Produces Precision Gears and High-Grade Special-Purpose Pumps

By CHARLES O. HERB

STANDARD equipment operated by men who have been trained to be tolerance conscious is the secret of success at the McIntyre Co., Newton, Mass., where tool-room precision is demanded in mass production operations. Behind the organization is the ingenuity of an engineer whose early experience as a precision watchmaker has been applied for years in perfecting gear pumps. It was at his insistance that tool-room tolerances were written into product specifications.

High quality work turned out for the U. S. Navy led to the request by other Government agencies for special pumps for a variety of wartime applications. One of these now in mass production is a gear type air pump used on

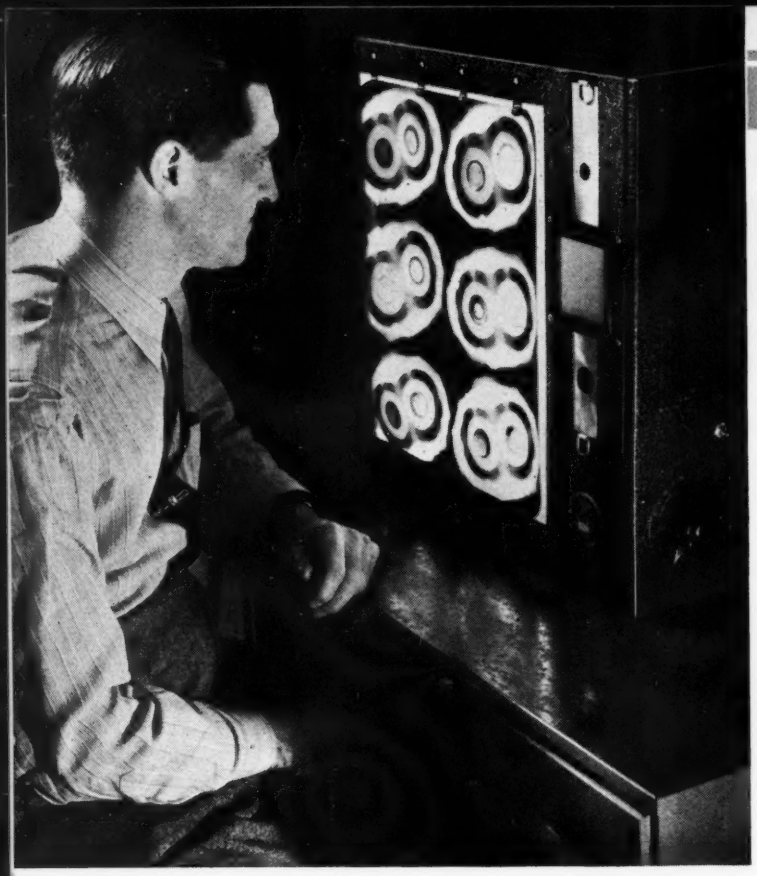


Fig. 1. All Castings Used in Producing Precision Gear Pumps are X-rayed to Detect Porosity and Other Defects before Machining

airplanes in conjunction with special equipment. This is actually an air compressor unit which will compress air from sea level to a height of 35,000 feet, develop from 13 to 17 pounds per inch absolute pressure, and compress a volume of air of 2200 cubic inches at the rate of 40 cubic inches per minute. The pump will develop from 27 to 30 cubic inches of vacuum. The 1/50-H.P. motor which drives this pump runs at 12,000 R.P.M.

This pump must function efficiently whether the plane is practically at sea level or at maximum heights with temperatures ranging from a high summer heat to as low as minus 65 degrees F. Such variations in temperature are of considerable importance in the operation of precision equipment because of the different amounts of metal expansion.

Another interesting wartime development is a fuel pump for combustion type aircraft heaters. This pump furnishes aviation fuel at pressures up to 44 pounds per square inch in quantities up to 5 gallons per hour. It is also of the spur gear type, with the gears revolving in recesses in a center plate that is assembled between two side plates in which are incorporated the ports through which the fuel enters and leaves the pump. This pump, as well as all other pumps, is sealed metal to metal without the use of gaskets, and must, therefore, be finished to provide as perfect a joint as possible. Actually, the mating surfaces of the center plate and the side plates are lapped within 0.00006 inch of perfect flatness.

Plans are under way for the post-war manufacture of an extensive range of metering pumps of spur gear design—pumps that will deliver predetermined amounts of liquid or air under a close volumetric control. The smallest pump in this line will deliver 0.22 cubic inch of liquid per minute at 20 R.P.M. and 1.10 cubic inches at 100 R.P.M. The largest pump of the line will deliver 180.8 cubic inches of liquid per minute at 20 R.P.M. and 904 cubic inches at 100 R.P.M. Precision gears of various types and worms will also be post-war products.

Each casting used in pumps made at the McIntyre plant is X-rayed to make certain that it is sound throughout before any machining is performed. A Keleket high-intensity illuminator containing photo flood lamps enables the X-ray films to be easily read. (See Fig. 1.)

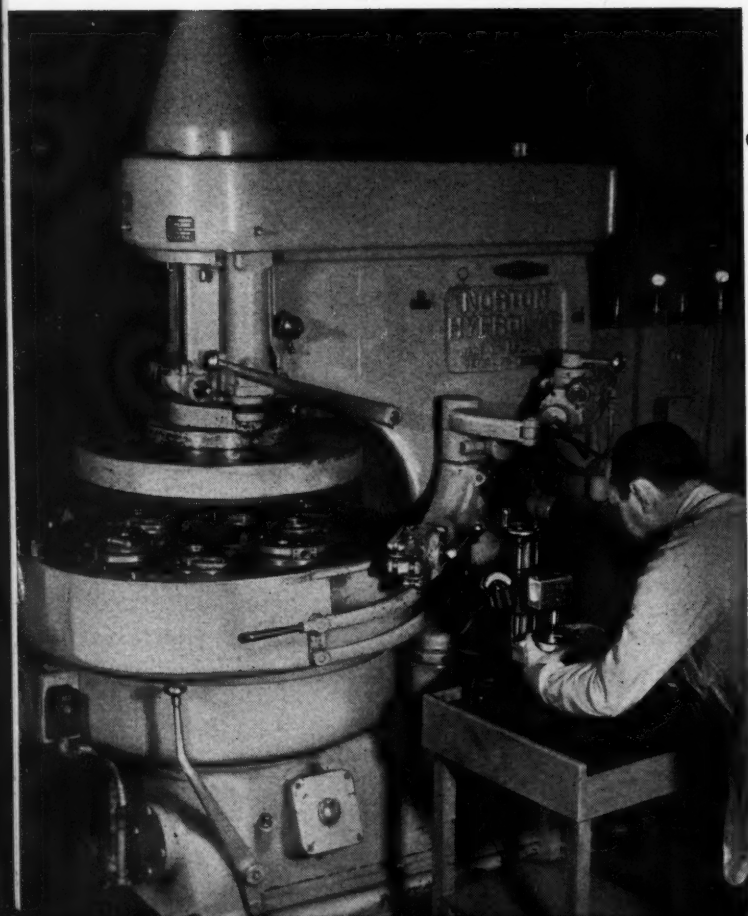


Fig. 2. Lapping Joint Face of Copper-ferrite Rear-sides for One of the Larger Hydraulic Pumps Produced by the McIntyre Co.

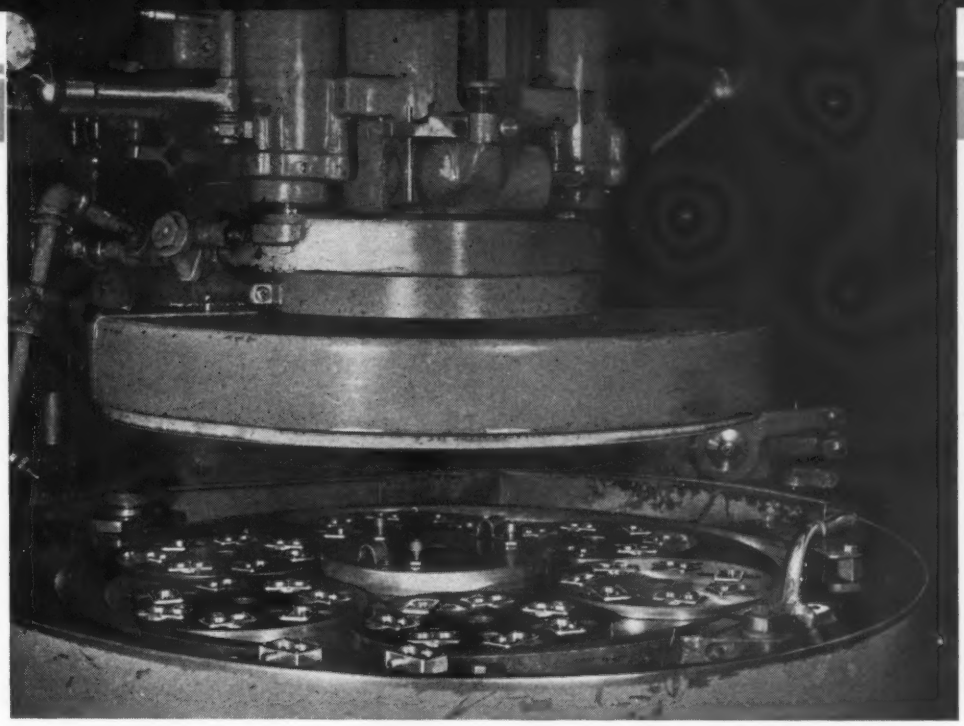


Fig. 3. Center Plates for Smaller Gear Pumps being Lapped on Opposite Sides Parallel and Flat within 0.00006 Inch

For the roughing operations on the various pump components, fairly liberal tolerances are allowed, but they become close with finishing operations. The first finishing operation on the center plate and the joint surfaces of the drive- and rear-side castings consists of lapping. On gears, the first finishing operation also consists of lapping the sides. This insures that the teeth will be cut at a true right angle to the sides and that the bore will be ground in a similar relation to the part.

Lapping of these flat surfaces is performed on a Norton Hyprolap machine, which is shown in Fig. 2 engaged in lapping the joint faces of hydraulic-pump rear-sides made of copper ferrite. Fig. 3 shows the same machine set up for lapping both sides of center plates for a smaller hydraulic pump. The center plates are held in disk type holders provided with openings to suit the outline of the plates. Seven of the smaller center plates are carried by each holder. The holders are retained on the lower abrasive wheel by a circumferential band, which is clamped in contact with the outer edge of the disks. The

Fig. 4. The Center Plates are Located from One of Their Lapped Surfaces on Faceplate of Grinding Machine for Grinding the Recesses

Fig. 5. (Left) Cast-iron Laps are Used for Finishing Small Shafts to a Tolerance of 0.0001 Inch

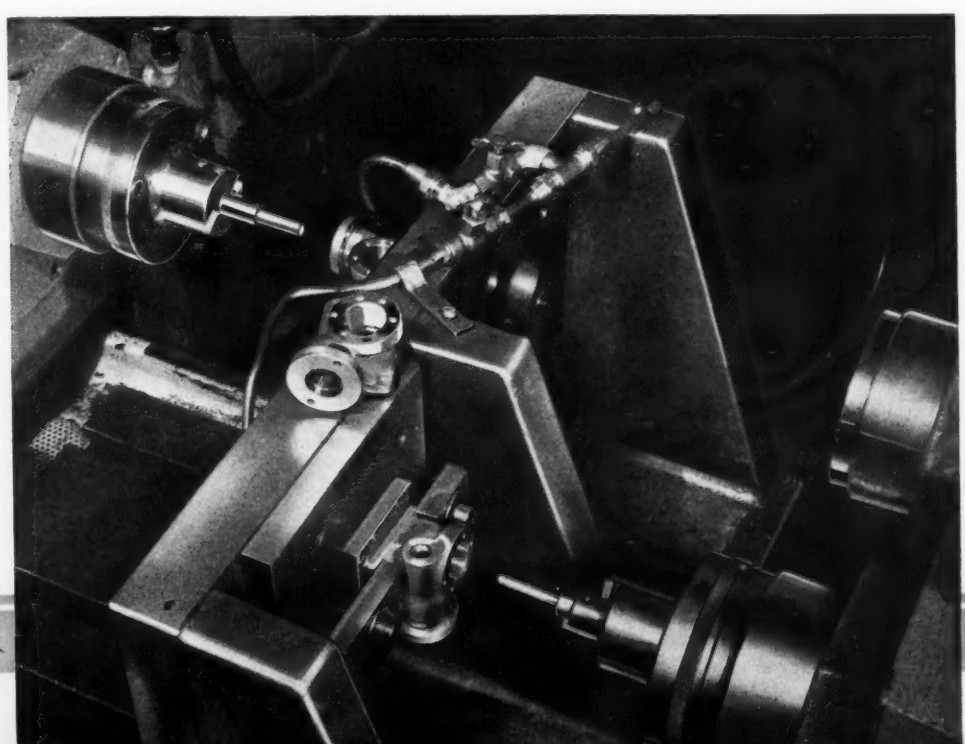
Fig. 6. (Below) Bearing Recesses for Drive- and Worm-shafts of Drive-side Castings are Finish-bored by Carbide Tools on Opposing Heads of Machine Here Shown

band pushes the holders against a central drum, which is mounted eccentrically in relation to the abrasive wheels, so that the holders are moved in and out on the wheels as they move around the machine with the wheels. In operation, the upper wheel is, of course, lowered on the work. The abrasive wheels are 36 inches in diameter.

The center plates, as well as other pump components, are both rough- and finish-lapped. In roughing, abrasive wheels of 100 grit are used, and in finishing, wheels of 180 grit. Wheels of 320 grit are employed in finish-lapping aluminum, while roughing wheels for this material are of 180 grit. The bottom abrasive wheel runs counter-clockwise and the upper wheel clockwise. Both are driven at relatively slow speed.

Rough-lapping is performed for five or six minutes, and finish-lapping for twelve minutes. Kerosene is used as a coolant and to wash away loose grit. This liquid is strained through a filtering unit which removes all particles that might scratch the highly polished lapped surfaces.

After parts have been lapped, they are routed to the Bryant chucking grinder seen in Fig. 4. This illustration shows the machine set up for grinding the two recesses in small center plates.



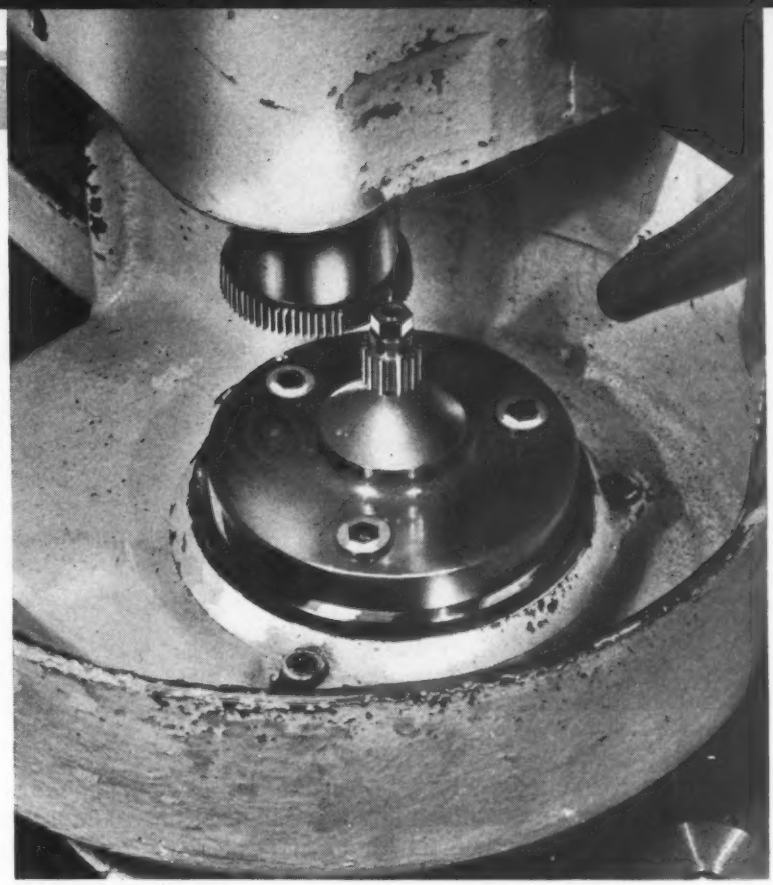


Fig. 7. (Right) In Shaping the Teeth on Pump Gears, a Washer is Placed beneath the Gear, so that Burrs will be Left on the Washer instead of on the Gear Itself

Fig. 8. (Below) All Gear Teeth are Shaved on Both Sides of the Teeth to Insure Maximum Accuracy

One recess is ground with the work set up as shown, and then the fixture is unlocked, indexed 180 degrees to locate the second hole in line with the grinding spindle, and relocked.

These holes are held to a specified center distance within plus 0.0005 inch, minus nothing. The diameter of the holes is held within plus 0.0001 inch, minus nothing. In grinding the holes, a close right-angle relation with the lapped surfaces is insured by locating the part on the faceplate of the machine from one of the lapped surfaces. Gears and drive- and rear-sides are handled in the same manner.

Recesses ground on the Bryant chucking grinder are checked on the machine for diameter by the Pratt & Whitney Air-O-Limit gage attachment seen on the machine in Fig. 4, or by the gage itself, which is seen in the heading illustration. In either case, the work is slipped over a plug having two small-diameter holes leading from opposite sides to the center, where they join an axial hole that is connected to an air line. The amount of air escaping through these holes when the gaging plug is inserted into a bore gives an indication of the hole size by causing movement of the indicator on a dial

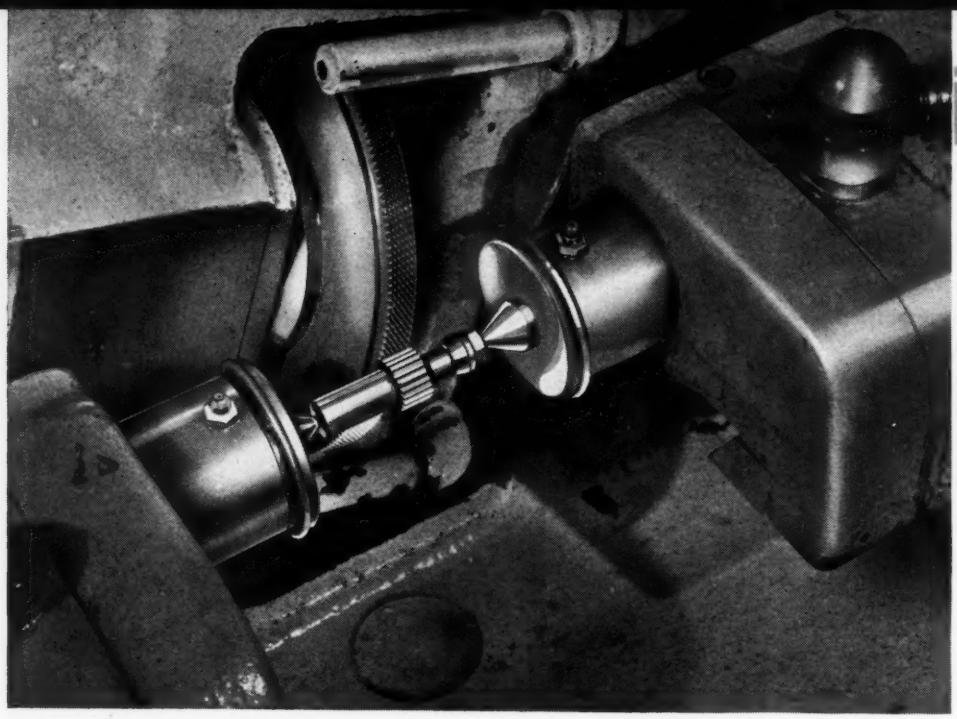


Fig. 9. View of Gear-shaving Machine Showing an Operation on Gears having Twenty-two Teeth of 30 Diametral Pitch. Run-out Tolerance on Pitch Line is 0.0004 Inch, and on the Outside Diameter 0.0001 Inch

graduated to 0.0001 inch. The graduations are 1/8 inch apart, and thus allow for inspection readings to fractions of ten-thousandths of an inch. Incidentally, the Bryant chucking grinder is run all day long without interruption, so that its various working parts are always operating at the same temperature.

Small pins or shafts are lapped on their cylindrical surfaces by the Norton machine shown in Fig. 5. The lower cast-iron lap of the machine is driven, while the upper cast-iron lap is stationary. The shafts are placed in a disk type holder, about 30 inches in diameter, which is provided with slots to carry 100 shafts at a time. An eccentric movement is imparted to the holder as the laps revolve. The shafts, which are made of Nitralloy, have been centerless-ground and nitrided when they reach the lapping machine. They are finished by that machine to between 0.3498 and 0.3499 inch diameter.

The aluminum drive-side castings are finish-bored on an Ex-Cell-O precision boring machine set up as illustrated in Fig. 6. The operation consists of finishing the bearing recesses for the worm-shaft and drive-shaft by employing boring heads on opposite ends of the machine. Carbide tools are used on all precision boring operations. The total tolerance on some of the diameters, which are all less than 1 inch, is as close as 0.0002 inch. Each boring-bar bores to several diameters, and in addition, faces two shoulders. Precision boring is the last machining operation on this part.

After the pump gear blanks leave the Bryant chucking grinder, they are transferred to a Fellows gear-shaper for cutting the teeth. In

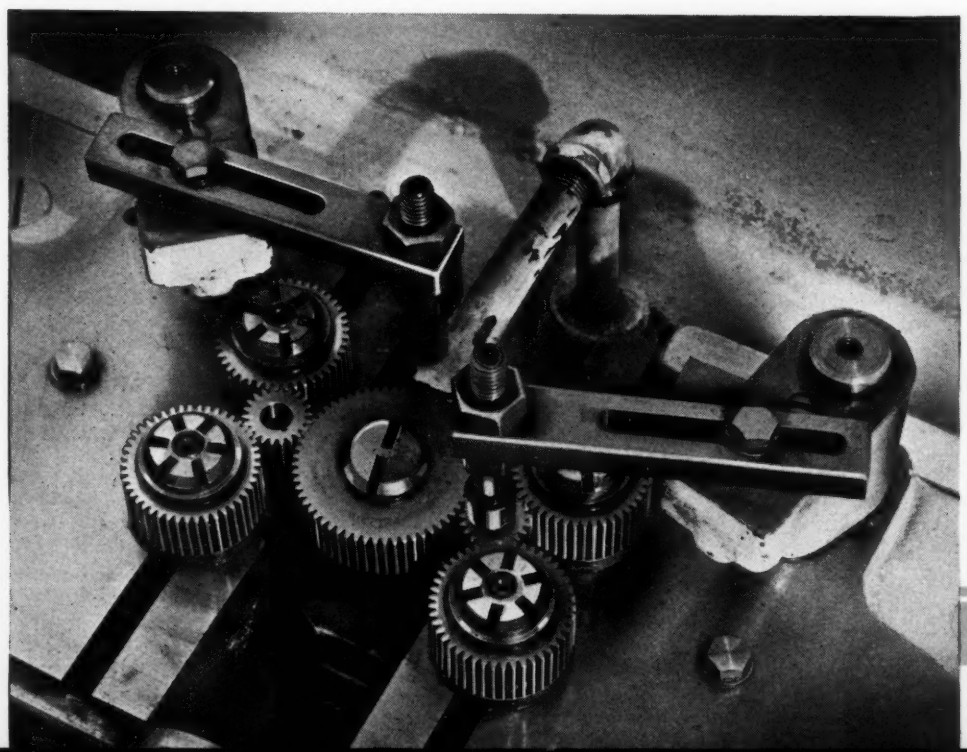


Fig. 10. All of the Pump Gears are Burnished for a Predetermined Length of Time, Depending on Work Hardness Desired on Gear Teeth

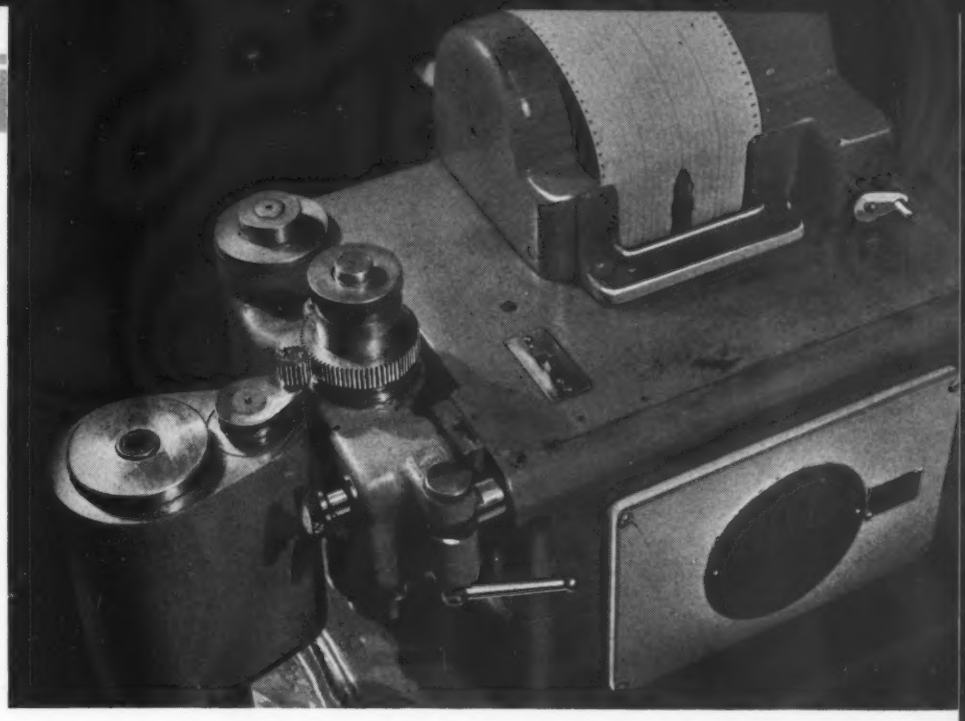


Fig. 11. All Gears are Checked on a Fellows Red Liner to Determine the Amount of Run-out, which is a Most Important Consideration in the Manufacture of Metering Pumps. Inaccuracies of 0.0001 Inch Can be Detected

Fig. 7, one of these machines is set up for cutting the teeth on gears for small hydraulic pumps. These gears have 22 teeth of 30 diametral pitch. The outside diameter must be held to size within plus nothing, minus 0.0001 inch. When burnished, the allowable run-out on the pitch line is 0.0004 inch, and on the outside diameter, which must closely fit a recess in the center plate, only 0.0001 inch. There must be complete contact of mating teeth on both the front and back sides without backlash.

The tooth-cutting operation is performed in the regular manner with a standard gap type cutter 2 1/2 inches in diameter. There are three revolutions of the work for one revolution of the cutter in machining a complete gear, there being three stages of cutting action. A washer is placed on the work-spindle beneath each gear blank, and the gear teeth are cut right through the washer. With this arrangement, the burrs are left on the washer instead of on the gear teeth.

After the cutting of the teeth, the gears are transferred to a Fellows gear-shaving machine, which is shown in Fig. 8 set up for operation on large size hydraulic-pump gears.

The shaving tool runs a predetermined length of time in one direction and then reverses and runs the same length of time in the opposite direction, so as to remove stock from both sides of the teeth. This cycle is repeated twice, the shaving tool being fed forward a slight amount by a cam. About 0.002 inch of stock is shaved off.

The close-up view in Fig. 9 shows the same machine arranged for shaving the small-sized Nitralloy gear that is seen being cut in Fig. 7.

Fig. 12. Gages and Gage-blocks are Checked by an Electronic Gage that can be Set to Read in Millionths, Ten-thousandths, or Thousandths of an Inch

Fig. 13. Surface of Drive-side is Ground with Castings Mounted on a Multiple Grinding Fixture that Holds Five Castings

The accuracy of all shaving operations is checked with an Electrolimit gage by taking readings over two wires placed in the gear teeth. A 7-inch diameter shaving tool had to be supplied for finishing the small gears because of the minimum center-to-center distance between the tool- and work-spindles and the comparatively small diameter of the work.

The time cycle in shaving varies with the size of the gears being handled. In the case of the small gear being shaved in Fig. 9, the time cycle is ordinarily about two minutes and thirty seconds, while in the case of larger gears such as seen in Fig. 8, the time cycle is five minutes. Stuart No. 99 thread cutting oil is used as a lubricant in all shaving operations.

After shaving, the small Nitralloy gears are passed to the Fellows burnishing machine, a close-up view of which is presented in Fig. 10. Here, the small gears are each placed between a central hardened and ground master gear 2 inches in diameter and two idler master gears. Each pair of idler gears is mounted on a slide, so that they can be moved to accommodate different diameter gears. Before the operation is started, a clamp on a swinging arm is positioned loosely over each work-gear, as seen at the right, so as to prevent the gears from rising out of engagement with the burnishers.

The practice is to revolve the gears in one direction for a predetermined length of time and then in the reverse direction for the same amount of time. The length of the cycle depends somewhat on the degree of work hardness desired on the gear teeth; the longer the operation, the greater the amount of work hardness. However, the length of the cycle is ordinarily twelve seconds. A lubricant is used in burnishing which consists of four parts kerosene to one part of light spindle oil. Graphite is added to the mixture. This lubricant is constantly passed through a filter at the rear of the machine. The master burnishing gear is driven at a speed of 2100 R.P.M.

All gears are checked on the Fellows Red

Fig. 14. Magnifying Glasses Mounted in Convenient Wooden Fixtures are Used Extensively for Observing Surface Defects on Finished Work

Liner (Fig. 11) after burnishing to determine their run-out, and the same equipment can, of course, be employed to check gear accuracy after tooth cutting and shaving operations. The gear to be checked is meshed in the normal manner with a master gear, as seen at the right. Then, as the master is revolved by hand, inaccuracies of the work-gear are indicated by a red line drawn on the paper record by an automatic scriber. The vertical blue lines on the paper are about 3/16 inch apart, and the total space between any two represents an inaccuracy of 0.001 inch, so that it is easy to detect inaccuracies in ten-thousandths of an inch. The master gear is 2 1/2 inches in diameter.

After removal from the Red Liner, all gears are checked for diameter on an Electrolimit gage by the wire method, as previously mentioned. The gears are later nitrided, after which they are ground on the outside diameter and again lapped on the sides.

A surface grinding operation performed on the aluminum drive-side is illustrated in Fig. 13. Five drive-sides are mounted on the fixture at one time, each being located from two flange holes, thereby insuring that the surface will be ground square with the bearing recesses. Wing-nuts on the threaded ends of the binding pins hold the work in place. Flatness of the ground surfaces and a high finish are required. The machine is a Brown & Sharpe No. 5 surface grinder.

In work of such close precision as here described, adequate inspection equipment is imperative and it is also essential that the shop always operate at the same temperature. To insure the latter, the entire shop is air-conditioned and the temperature of the gage-room is accurately maintained at 68 degrees F., in accordance with the requirements of the United States Bureau of Standards. Closer tolerances than those specified on the work are, of course, specified for the gages, and consequently the limits on gages run as close as plus or minus one-fifth of one ten-thousandth of an inch.

The gages and gage-blocks are all checked on the Federal electronic gage shown in Fig. 12, which is of an adjustable type so that the graduations on the dial can represent increments as fine as three-millionths inch or as coarse as three-thousandths inch. As the graduations are 1/16 inch apart, it is a simple matter to estimate to within one-millionth of an inch. There are ten electronic tubes of four different types in the unit seen at the right. This equipment is so sensitive when set for reading to millionths of an inch that the temperature developed by merely placing a finger against the vertical post will cause perceptible deflections of the dial indicator.

Electrolimit and Air-O-Limit gages, as well as ordinary indicator gages, are used extensively throughout the shop, both at the individual machines and at inspection benches. Parts are given a careful visual examination through strong magnifying glasses set up on convenient box type fixtures of the type shown in Fig. 14. Scratches and other surface defects remaining after lapping can be readily observed through the glass.

The special inspection jig shown in Fig. 15 provides for seven separate height inspections on the drive-side pump castings. Two gages check over-all heights, and the remainder the distance from outside faces to shoulders. Master

Fig. 15. Special Gaging Fixture Equipped with Seven Dial Indicators for Checking a Similar Number of Dimensions on the Drive-side Castings

gages used in setting the dial indicators to zero are seen on the table in front of the fixture.

In addition to an inspection department for checking dimensions, there is a separate laboratory in which the assembled pumps are given extensive tests to determine their performance under a variety of temperature and atmospheric conditions. Temperatures as low as minus 95 degrees F. and as high as 300 degrees F. can be obtained in a test chamber which reproduces atmospheric conditions from sea level to 75,000 feet. Research and experimental laboratory facilities are available for developmental work as well as the production testing of all products.

Under-Water Welding Photographed for the First Time

THE practicability of welding and cutting under water has been proved by a number of recent applications, such as salvage work on damaged war vessels. However, such work has literally been "done in the dark," as no one except the diver has been able to see the actual operation of under-water welding and cutting. According to information obtained from the Lincoln Electric Co., Cleveland, Ohio, the accompanying photograph is the first picture ever obtained of under-water welding.

The illustration shows R. L. E. Cook, welding engineer of the Armco International Corporation, performing arc-welding under 15 feet of water. The welding is done with a mild steel electrode having a special coating that is impervious to water. The photograph was taken through a port hole in a specially designed tank employed for training welders in under-water welding and cutting operations in the Panama Canal Zone.

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The annual index to MACHINERY (Volume 51—September, 1944, to August, 1945) is now available to subscribers and readers. Copies will be sent upon request, without charge.

What is Believed to be the First Photograph ever Taken of a Welding Operation Performed under Water

Initial Contact of Milling Cutter and Work-Piece

The Importance of the Initial Contact between the Teeth of a Milling Cutter and the Work being Milled has been Largely Overlooked in the Past. This Article Presents an Original, Comprehensive Study of This Subject, Calling Attention to Many Factors that have Seldom been Taken into Consideration

By Dr. M. KRONENBERG
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WHILE carbide-tipped tools with negative rake angles have been successfully employed for a number of years in intermittent turning operations, this technique is a relatively recent development in the case of milling operations. The reason for this may well lie in the more complex nature of the initial contact of milling cutter and work, compared with that of a turning tool and work.

In the simple case of machining a slotted flange in a plunge cutting operation, the location of the initial contact can easily be controlled. As shown in Fig. 1 at *A* and *B*, a negative back rake is the only requirement for shifting the initial contact from the sharp point *S* of the tool to a point farther back, where the tool is stronger. Turning a shaft with a keyway, using a longitudinal feed, is a more involved case in that three tool angles affect the location of the initial contact; these angles are the effective back rake, the side rake, and the side-cutting edge angles.

In the case of milling operations, a fourth quantity must be taken into consideration, which is not a property of the tool itself, but depends on the position of the milling cutter relative to the work. This fourth quantity, later referred to as the "angle of engagement," plays a significant part in the location of the initial contact.

Little attention has so far been given to this problem. It seems, therefore, important to analyze, mathematically, the contact conditions of tooth and work. The results of this study are explained in this article by means of a model, and are incorporated in a "cutter engagement diagram" (see page 154), which has been prepared as an aid for the production and tool engineer.

The Cutter Contact Model

In the model shown in the heading illustration, the cutter body is represented by an arm that can be rotated about the "cutter axis." Several "tools" (marked 1 to 6) with various rake and corner angles, can be attached to the cutter body. All tools have straight cutting edges. In addition, several "work-pieces" are employed for demonstration, because the slope of the "transient surface" produced on the work-piece varies with the corner angle of the tool. The transient surface is generated by the cutting edge and connects the "work surface" with the "machined surface." Three work-pieces are shown in the heading illustration with slopes corresponding to corner angles of 10 degrees, 25 degrees, and 45 degrees. The model can also be used for demonstrating initial contact when the cutting edge is not a straight line by preparing suitable "tools" and corresponding "work-pieces." The angles of the tools used in connection with the cutter contact model are given in the accompanying table.

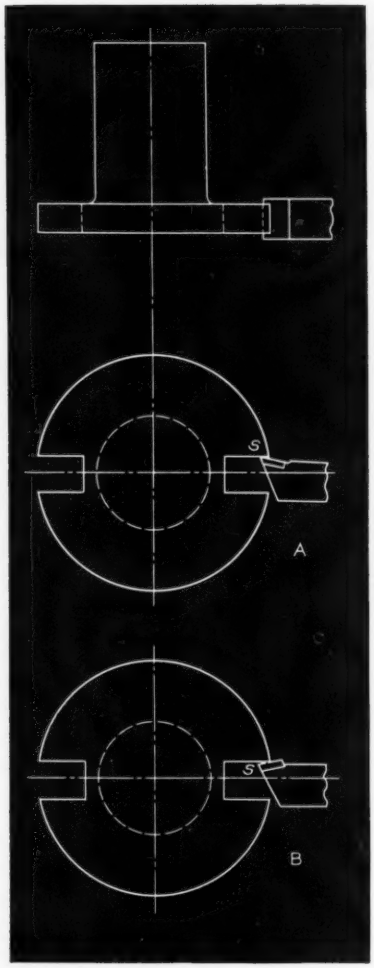


Fig. 1. Initial Contact Produced by Positive and Negative Back Rake when Turning a Slotted Flange

The area on the side wall of the model work-piece where the cutter enters is made of elastic material, and thus can be deformed when brought into contact with the tool face. This side wall is termed "plane of engagement." The tool face is made of frosted glass, thus permitting the observation of the location of the initial contact. The position of the work-piece relative to the cutter axis can be changed on the model by moving the work-piece, in circular slots, parallel to itself in a direction perpendicular to the direction of feed. This simulates a cross-adjustment of the table of a vertical milling machine or an up-and-down adjustment of the knee of a horizontal milling machine when setting up a job.

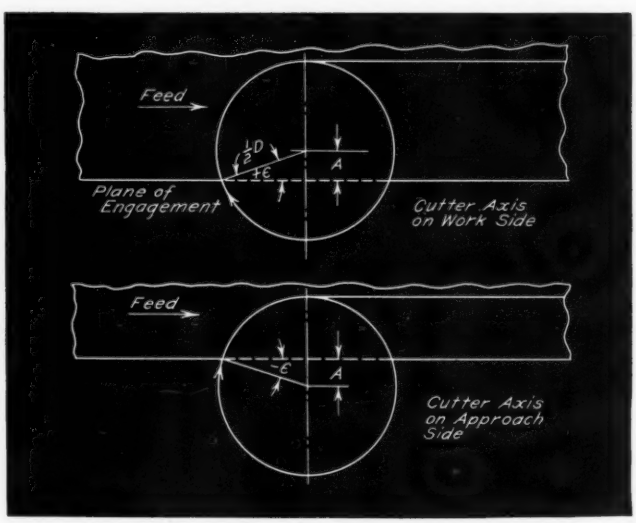


Fig. 2. Positions of Cutter Axis Relative to the Work-piece

The position of the cutter axis relative to the work-piece (dimension *A*, Fig. 2) and the cutter diameter (to the sharp point of the tool) determine the "angle of engagement" (ϵ). This angle is considered positive if the cutter

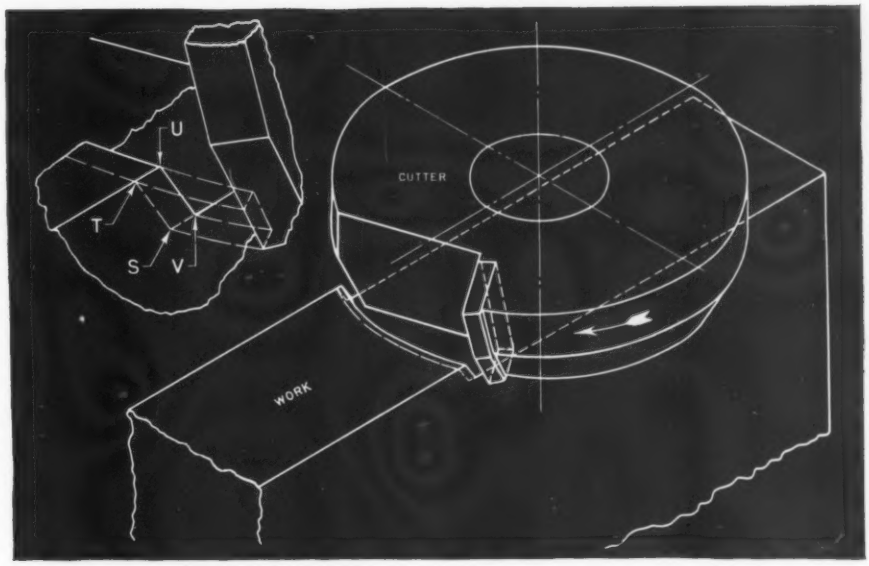


Fig. 3. Diagrammatic View Illustrating Initial Engagement of Cutter and Work

axis is on the "work side" and negative if it is on the "approach side" of the plane of engagement.

From Figs. 3 and 4 it is evident that the material removed by a tooth with a straight cutting edge is indicated by the parallelogram *STUV*, the height of which depends on the depth of cut, and the width on the feed per tooth. This parallelogram develops gradually as the tooth enters the work, and therefore the question arises: What spot on the contour of the parallelogram is generated first, or in other words, what spot on the tool hits the work first?

For the sake of simple identification of such spots, the following letters will be used:

S represents contact at the "sharp point" of the tool.

T represents a point on the *cutting edge* located at a height above the machined surface equal to the depth of cut.

U indicates a point on the *tool face* at the same height as point *T*, but remote from cutting edge by approximately the feed per tooth.

V has been assigned to a point on the *face edge* distant from *S* by approximately the feed per tooth.

Four Typical Examples of Initial Contact of Cutter and Work

1. Fig. 5 represents a set-up where the cutter axis is on the "approach side"; this occurs when only a portion of the width of the work-piece is machined, or when a straddle-mill is used. Tool No. 2 is attached to the cutter body of the model set to an angle of engagement of ϵ equal to —20 degrees. The tool angles are:

Angles of the "Tools" Used in Connection with the Cutter Contact Model

Tool No.	Axial Rake, Degrees	Radial Rake, Degrees	Corner Angle, Degrees
1	+10	+10	25
2	+10	—10	25
3	—10	+10	25
4	—10	—10	25
5	—10	—10	10
6	—10	—10	45

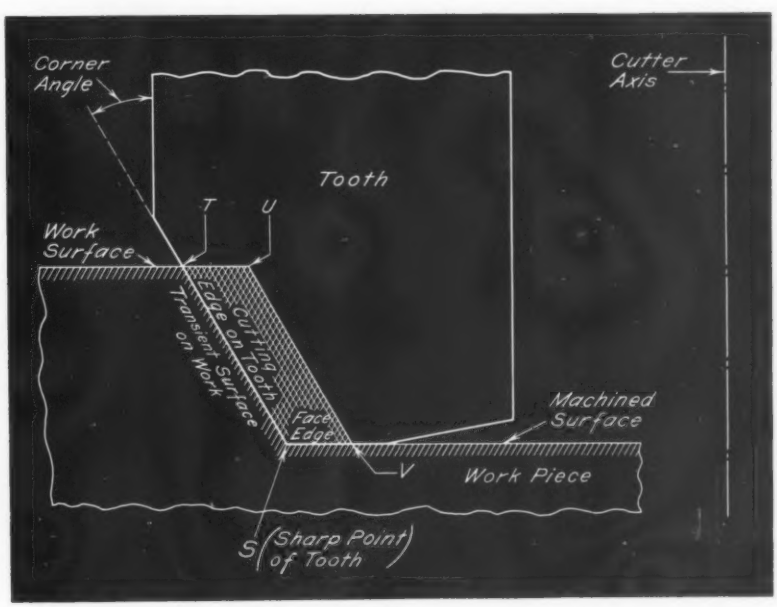


Fig. 4. Diagram Giving Symbols for Contact Points of the Cutter and Work-piece

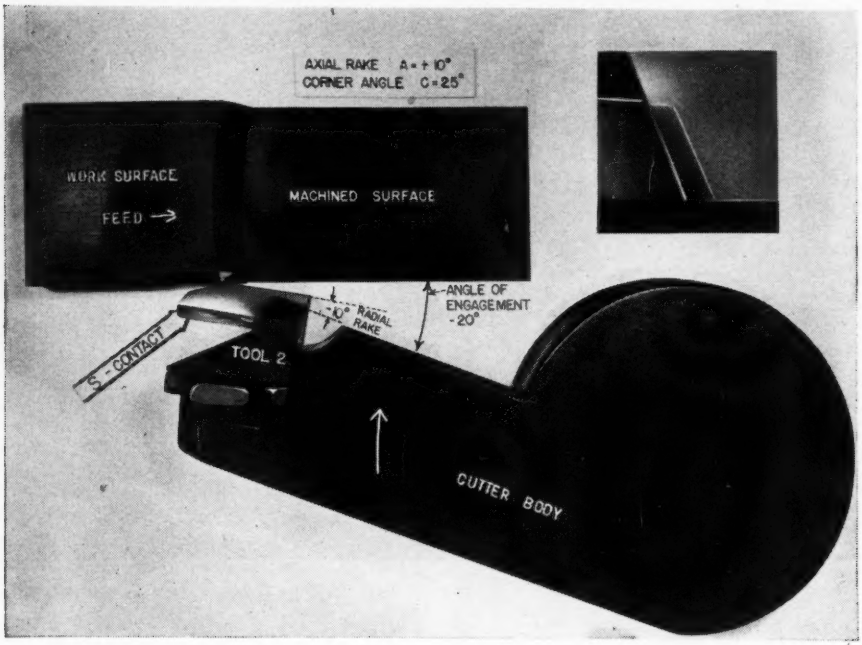


Fig. 5. Model Showing Initial Contact Occurring at the Sharp Point of the Tool (S Contact)

Axial rake, + 10 degrees; radial rake, — 10 degrees; corner angle, 25 degrees. It will be seen that there is *S* contact — that is, the sharp point *S* is engaged first. This is the weakest spot of the tool, and initial contact there is undesirable. The example indicates that this unfavorable type of contact can occur, although one of the rake angles—the radial rake—is negative, while the axial rake is positive. This is an important finding, as too often it is assumed that contact at the sharp point cannot occur when one of the rake angles is negative.

2. The result of changing the axial rake from + 10 to — 10 degrees, leaving all other conditions as in Example 1, is indicated by Fig. 6, where tool No. 4 is attached to the cutter body. The contact is shifted from *S* to *T* — that is, to a point farther up on the cutting edge.

3. The location of the initial contact may be changed, without changing the cutter design, by altering the set-up—that is, by placing the same tool as before (tool No. 4) in a different position relative to the work. This is proved by Fig. 7. Here the cutter axis is on the "work side," at an angle of engagement of + 20 degrees instead of — 20 degrees as before, while the tool design remains the same as in Example 2. Contact now occurs at point *V*—that is, at a point on the face edge remote from the sharp point *S* by approximately the feed per tooth.

It is often overlooked that the relative position of cutter and work has an important bearing on the location of the initial contact. This fact may explain the difference in performance sometimes encountered with any given cutter when placed in different positions with respect to the work.

4. Another factor often not taken into consideration, but that appreciably

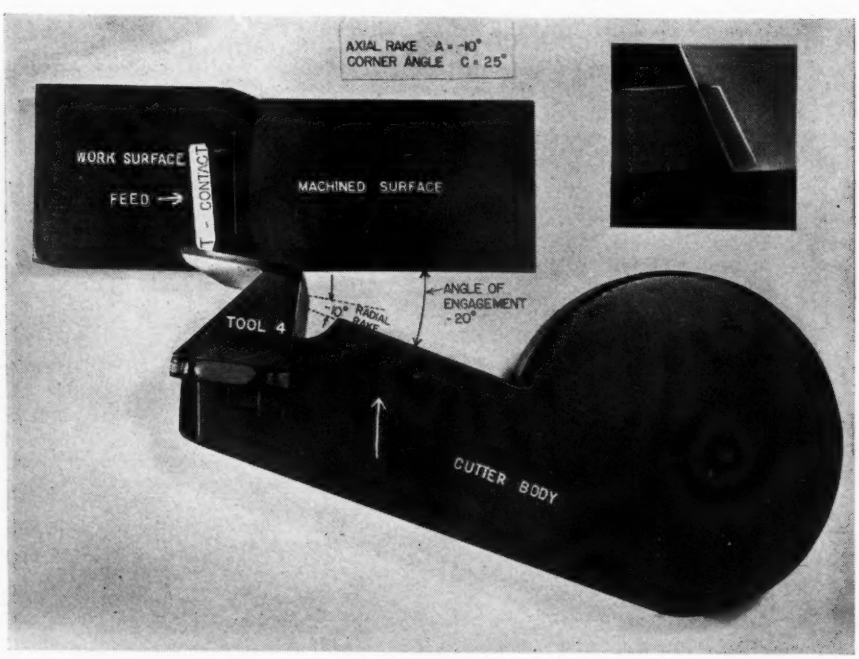


Fig. 6. Model Showing Initial Contact at a Point on the Cutting Edge in Plane of Work Surface (T Contact)

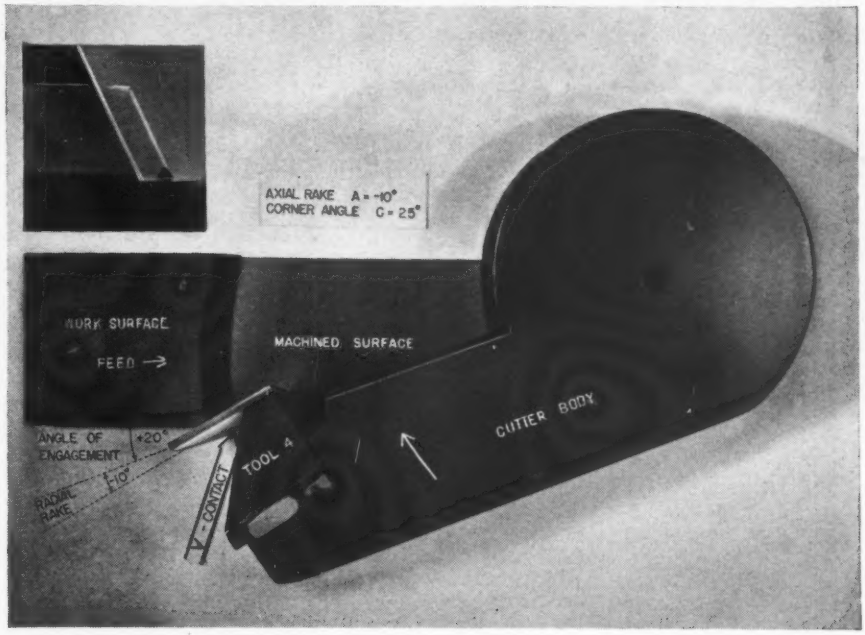


Fig. 7. Initial Contact at a Point Remote from Cutting Edge in the Plane of Machined Surface (V Contact)

affects the location of initial contact, is the magnitude of the corner angle of the tooth. This is demonstrated by Fig. 8. Except for a change in the corner angle from 25 to 10 degrees (tool No. 5), Example 4 is identical with Example 3. The initial contact, however, is now at point *U*, which is a point on the tool face remote from both the cutting edge and the face edge.

This type of contact is desirable as far as shock resistance of the tooth is concerned, because impact occurs at the strongest possible point of application on the tool. However, for final judgment as to the most desirable combination of angles, it is necessary to consider also the *magnitude of impact* (which is a function of the rate of increase of contact area) *and the direction in which the chip will travel* as the tooth passes through the work.

If the tool angle combination results in a negative angle of inclination of the cutting edge, the chips travel toward the machined surface and may pile up between cutter body and work. (The angle of inclination is the angle between the cutting edge and a plane normal to the path of motion.) Friction between chip and tool will likewise have an effect, and therefore, it is not possible at present to state that *U* contact will *always* be the best type of initial engagement. It now appears that there are cases where *V* contact is preferable; for example, when the angle combination for such contact provides a more gradual load increase in connection with a desirable direction of chip flow than an angle combination resulting in *U* contact.

There are five more types of initial contact in the case of straight-edged tools, in addition to those discussed in the preceding paragraphs. While the four examples shown by Figs. 5 to 8 represent *point contacts* at *S*, *T*, *V*, and *U*, Figs.

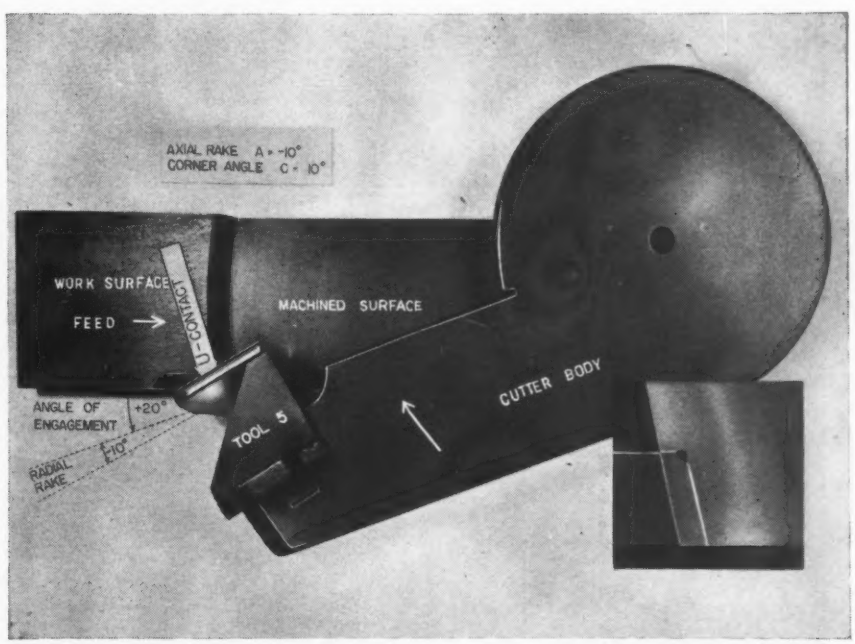


Fig. 8. Initial Contact at a Point Remote from Cutting Edge in the Plane of the Work Surface (U Contact)

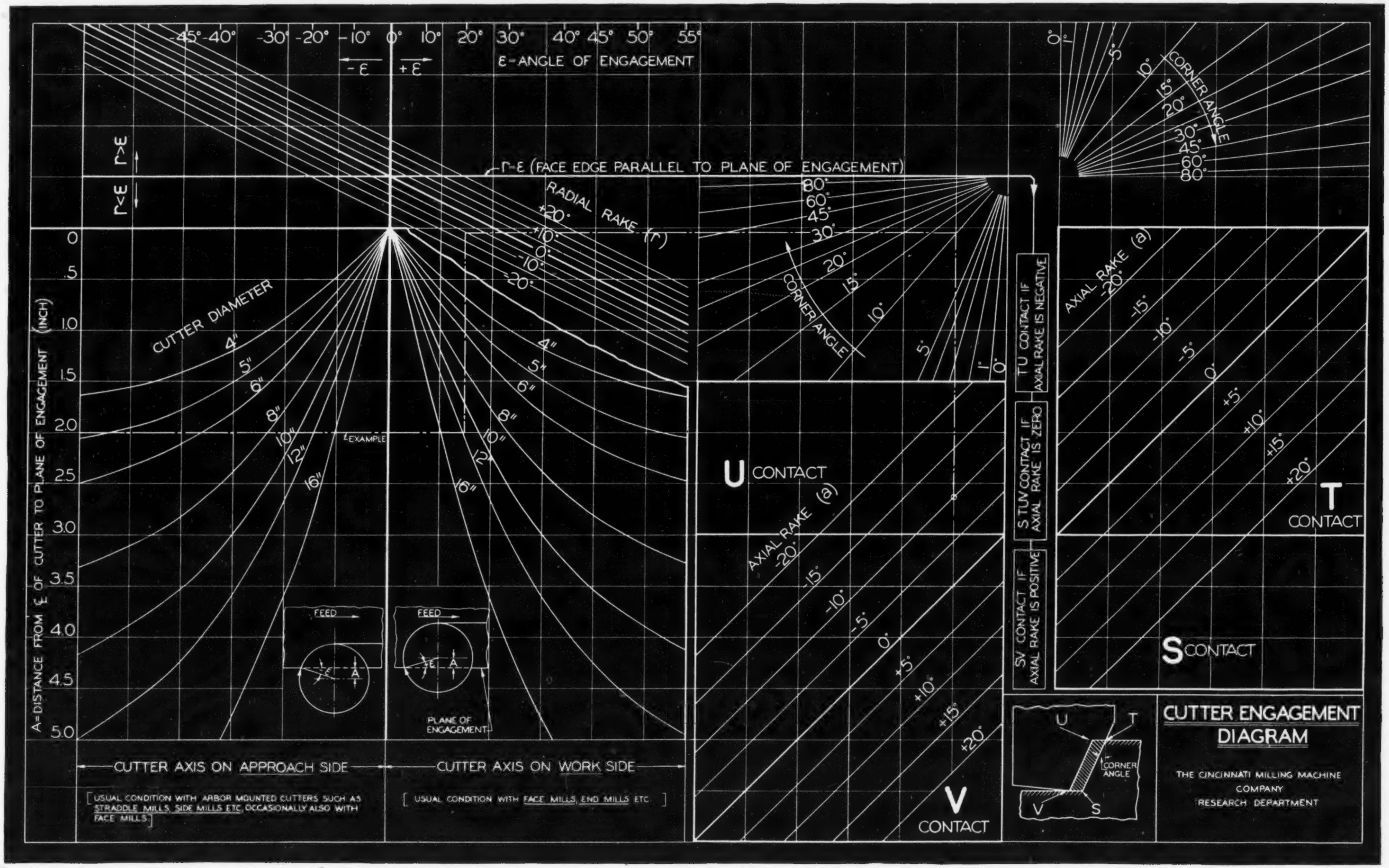


Chart for Determining the Type of Contact Resulting from Various Combinations of Cutter Diameters, Tooth Angles, and Other Factors

9 to 12 show that four types of *line contacts* can also occur.

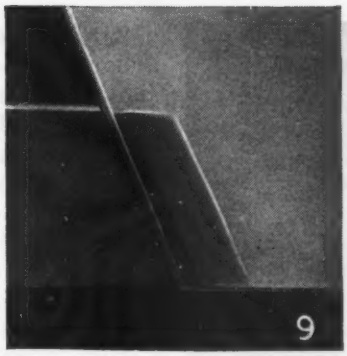
Fig. 9 indicates contact along line *ST*. In such a case, all points of the cutting edge hit the work simultaneously. This is obviously an undesirable condition. Fig. 10 shows contact along line *TU*. Fig. 11 represents *UV* line contact, where the tool face engages the work along a line parallel to the cutting edge but remote from it by approximately the feed per tooth. The direction of chip flow and the magnitude of impact will determine the desirability of this type of contact, as previously discussed in connection with the example for *U* contact (Fig. 8). Fig. 12 refers to the case of *SV* line contact, where all points of the face edge engage simultaneously.

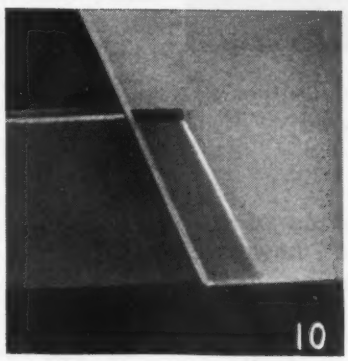
A ninth possible case is a "plane contact" (Fig. 13), where the entire face of the tool contacts the work simultaneously in an area equal to the chip cross-section. This type of contact will generate maximum impact.

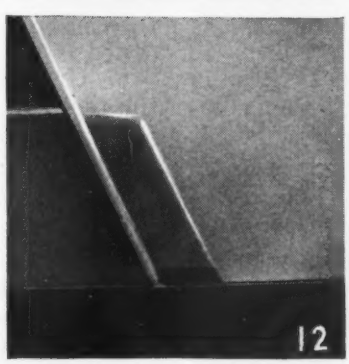
Cutter Engagement Diagram

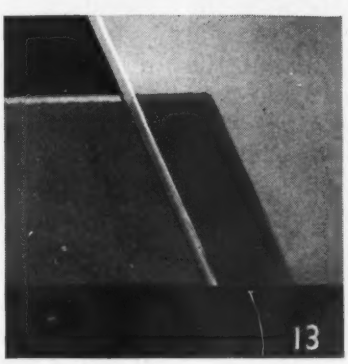
A "cutter engagement diagram" (see page 154) has been prepared as a simple means for determining the type of contact ensuing from any combination of cutter diameter, distance of the cutter axis from the plane of engagement, radial rake, axial rake, and corner angle. The diagram refers to the usual case shown by the model, where the tooth of the cutter has a straight cutting edge and the plane of engagement on the work extends parallel to the direction of feed and is perpendicular to both the ma-machined and the work surfaces.

Four fields will be seen in the diagram, marked in counter-clockwise order: *S* contact, *T* contact, *U* contact, and *V* contact. Three smaller rectangles, flanked by the *S* and *T* fields on the right side, and the *U* and *V* fields on the left side, refer respectively to *TU* line contact, *STUV* plane contact, and *SV* line contact. The two remaining types of contact—that is, *ST* line contact and *UV* line contact—are determined by the border lines between the *S* field and *T* field, and the *U* field and *V* field, respectively.









Distance *A* of the cutter axis from the plane of engagement (Fig. 3) is plotted at the left-hand side of the diagram; this scale is related through curves for cutter diameters to the angle of engagement (ϵ) plotted at the top of the diagram. Radial rakes are indicated by oblique lines located above the diameter curves. The corner angles are plotted as rays above the fields indicating the types of contacts, which, in turn, are intersected by oblique lines representing axial rakes.

The type of contact can easily be determined by tracing along straight lines from one variable to the other, continuing to the next variable at 90-degree angles. This is shown by a dot-and-dash line marked "Example."

The example refers to a case where, at a distance *A* equal to 2 inches, a cutter with a diameter of 12 inches is located on the work side. The radial rake is assumed to be 10 degrees negative, the corner angle 10 degrees, and the axial rake 10 degrees negative. Following the dot-and-dash line leads to the *U* field. Hence *U* contact will ensue from these conditions. The example is identical with that shown by the model in Fig. 8. The angle

Fig. 9. Contact along Line ST
Fig. 10. Contact along Line TU
Fig. 11. Contact along Line UV
Fig. 12. Contact along Line SV
Fig. 13. Plane Contact of Entire Area STUV

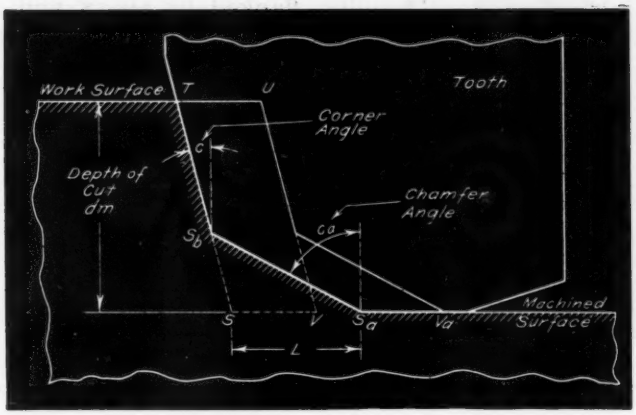


Fig. 14. Contact Points when the Cutting Edge of the Tool is Chamfered

of engagement can be read at the top of the diagram ($\epsilon = 20$ degrees); it is not, however, necessary to read this angle when using the diagram.

Applying Diagram to Cases where Cutting Edge is Not a Straight Line

The cutter engagement diagram on page 154 applies also to cases where the cutting edge is not a straight line, but chamfered, as shown in Fig. 14. Chamfering the tool introduces a secondary corner angle c_a which, however, affects the type of initial contact only in certain cases. As a rule, the diagram is used as if the cutting edge were straight—that is, the contact is determined by means of corner angle c. The ensuing contact holds also for chamfered cutting edges, *except* when S or U contact is indicated by the diagram.

In the case of S contact, a secondary tracing across the diagram is necessary, using the chamfer angle c_a instead of the corner angle c. If this second tracing again ends in the S field, the actual contact occurs at point S_a (Fig. 14); if the second tracing leads into the T field, the actual contact occurs at point S_b; and if it leads to the ST border line, the contact is along line S_aS_b.

In the case of U contact (indicated when using corner angle c), the modification in the use of the diagram is more complex, because the ratio of dimensions L and d_m (Fig. 14) affects the type of initial contact. In many cases, the actual contact will then occur at point V_a instead of point U, due to chamfering. The larger L is, and the smaller d_m, the more likely is this change.

Conclusions

A—Straight Cutting Edges

1. *V contact* will generally occur in the case of face mills, end-mills, and other cutters usually located on the work side.

2. *T contact* will usually occur in the case of arbor-mounted cutters, such as straddle-mills, side-mills, and other cutters always located on the approach side.

3. The undesirable type of *S contact* (at the weakest point of the tool) can be avoided by grinding a negative axial rake angle on the tool.

4. *U contact* can result only when the axial rake is negative; the radial rake, however, may be either positive or negative, but must be smaller than the angle of engagement. This latter condition is generally satisfied when the cutter axis is on the work side, as usual with face mills and end-mills, except when the cutter axis is close to the plane of engagement—that is, nearer to it than about 20 per cent of the cutter diameter.

5. A corner angle of zero degrees favors *U contact* most. The larger the corner angle, the less likely there is to be U contact. If the corner angle exceeds a definite value, depending on the combination of the other three angles, there will be V contact instead of U contact.

6. The radial rake affects the location of initial contact to a lesser degree than the axial rake, except when the cutter axis is close to the plane of engagement.

7. Tool angles on milling cutters alone do not determine any type of initial contact. It is also necessary to consider the angle of engagement. An existing milling cutter with given rake angles and corner angle may perform differently when placed differently with respect to the plane of engagement, because a change in the location of initial contact may be involved in changing the set-up.

B—Chamfered Cutting Edges

8. Grinding a chamfer angle c_a, Fig. 14, on the tooth in addition to the corner angle c does not alter initial contact at point T or along line TU. Hence a chamfer is ineffective in these cases as far as initial contact is concerned.

9. Initial contact at point V is not basically changed by chamfering the tooth, because the contact occurs in such case at point V_a, which has the same properties as point V. The same holds for the case of SV contact which corresponds to S_aV_a contact.

10. Grinding a relatively large chamfer angle to a straight cutting edge having S contact will shift the point of contact in the direction of the cutting edge (to S_b)—that is, out of the plane of the machined surface—while a small chamfer angle will shift it in the direction of the face edge (to S_a).

11. Grinding a chamfer to a straight cutting edge which would contact all along its length (ST contact) reduces the length of contact to the portion of the cutting edge not touched when grinding the chamfer (S_bT contact).

Rearrangement of Four-Spindle Drill Presses Increases Production

By changing the position of two idle spindle units of straight-line four-spindle drill presses so that two pairs of spindles are located back to back, and building auxiliary tables, a second production line was established from the previously unused spindles at the Lynn River Works of the General Electric Co. without interfering with the original production line. Originally, four operations were performed on two of the four-spindle drill presses, utilizing only two spindles on each machine. Drilling was done on the first and third spindles on the first machine and a countersinking operation was performed on the first and third spindles of the second machine.

The first machine with the original arrangement, shown in Fig. 1, required one operator for the drilling operation performed by the two spindles, while two operators—one for each spindle—were required for the countersinking operations on the second machine. Insufficient space for setting up jigs on the table under each spindle made it necessary for two spindles to remain idle on each drill press.

With the new arrangement, shown in Fig. 2, sufficient room is provided for the fixtures so that all four spindles of each machine can be kept in continuous operation. Thus, by simply changing the positions of the idle spindle units, a second production line has been established at the rear of the machines, as previously mentioned, which eliminates the frequent changing of jig and fixture set-ups.

* * *

It is likely that portable equipment will provide an expanding market for magnesium. Whenever a device must be lifted or moved about, light-weight metals will be considered. Pattern plates, foundry flasks, and core-boxes have been made from magnesium. It is said that by reducing the weight of a core-box from 15 to 10 pounds through the use of magnesium, the core output per man was increased in one foundry as much as 20 per cent. Magnesium also offers the advantage that the metal resists the wearing action of sand.

Fig. 1. Four-spindle Drill Press with All Spindles in Straight-line Normal Positions

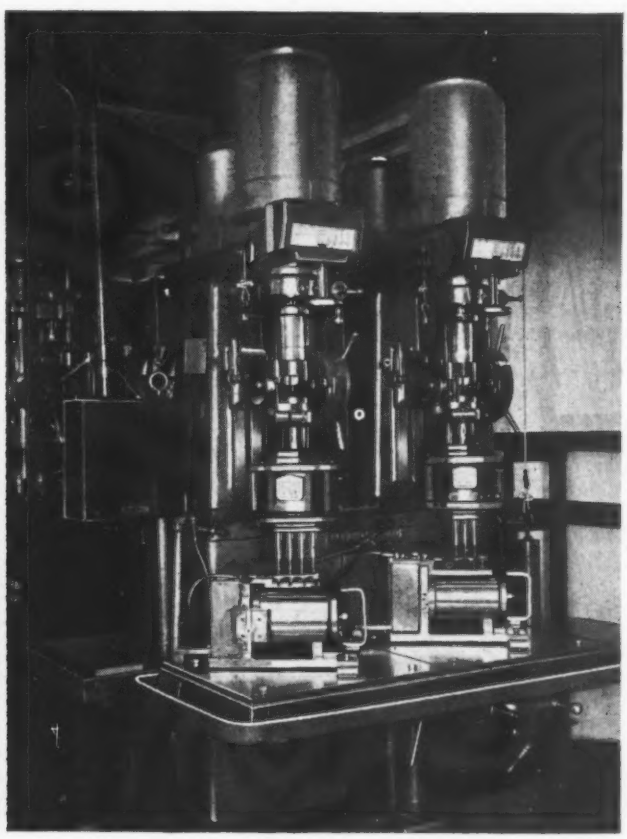


Fig. 2. Drill Press with Two of Four Spindles Placed at Rear to Form Second Production Line

Unusual Results with Automatic Soldering

By W. R. GRAHAM
Automotive Engineer, Roselle, N. J.

Eliminating Hand Work and the Need of Skill in Soldering Increased Production Nearly 450 Per Cent in One Case, and Also Improved the Product

IN one of the commercial types of oil-filters for automobile engines, the metal case is made in two halves, each of which is cup-shaped. The open ends of these cups are lap-joined to each other, after which the joint is soldered on a machine of the conveyor type. A first-class job is required, as the case must, in a subsequent test, withstand a hydraulic pressure of 100 pounds per square inch.

For feeding the solder to the case, the machine is equipped with an automatic fixture located at the side of the conveyor, its construction being clearly shown in Figs. 1, 2, and 3. The joint is first preheated and automatically fluxed at another point on the conveyor. There is also a gas burner opposite the fixture which melts the solder as it is fed to the case, so that it will flow around the joint as the case revolves. Because of their simplicity, however, the preheating, fluxing, and melting arrangements are not shown in the illustration.

Incidentally, before the fixture was incorporated in the conveyor, four men were required to solder 2000 cases per day of 8 3/4 hours. At present, with one operator, 2200 cases are soldered during the same period of time, and a better job is obtained than formerly. It is believed that this production could be nearly doubled by increasing the speed of the conveyor and the solder-feed gearing.

Each case, as it passes the fixture, is rotated at a speed suitable for the soldering operation by means of the stationary rack *A* (Fig. 1). This rack meshes successively with the pinion gears *B* which are secured to the lower ends of the shafts on which the casing holders are mounted, as indicated.

The fixture is designed to feed 1/8-inch wire solder from a reel mounted on the base of the machine. From this reel the solder passes over the guide pulley *D* secured to the slide *E*, and then between the two rolls *F* and *G*, Fig. 2.

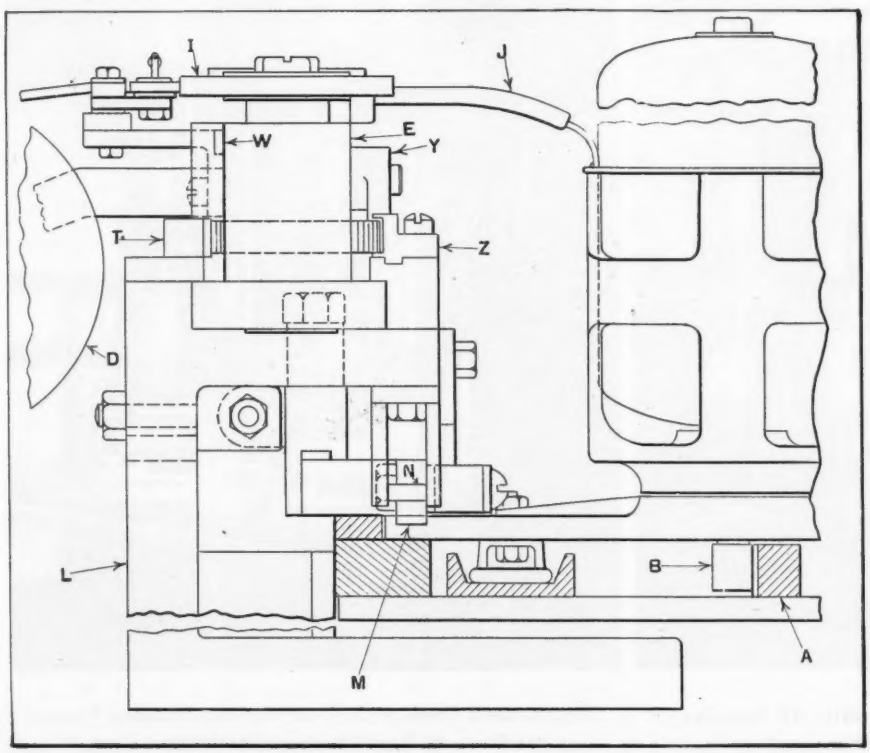
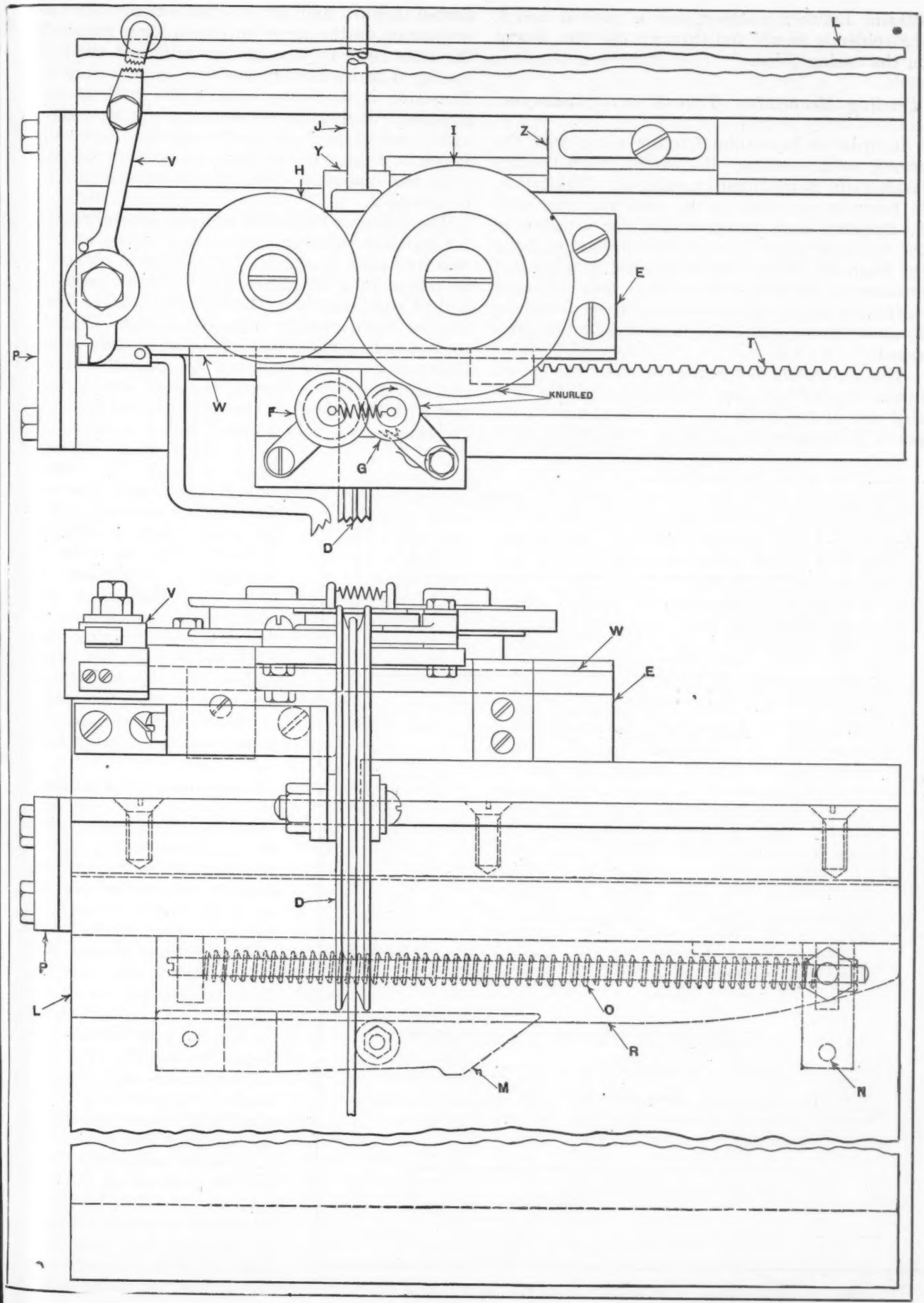


Fig. 1. (Left) Side View of Fixture Illustrated in Fig. 2, Showing how Solder Wire is Fed on the Casing Joint, where It is Melted

Fig. 2. (Opposite Page) Soldering Fixture for Delivering Solder Wire at a Uniform Feed to Casings Mounted on a Conveyor


L
J
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Passing between another pair of rolls *H* and *I*, the solder is finally fed through the tube *J* and on the casing joint.

Feeding Mechanism Travels with Conveyor

In order to have tube *J* follow along with the casing being soldered, the entire solder-feeding mechanism is mounted on slide *E*. The latter, in turn, is mounted on the stationary member *L*. Opposite each casing holder and attached to the conveyor chain is a projection that engages the latch *M*. This latch is pivoted to a bracket attached to the slide and serves to lock the latter to the conveyor, causing both of these members to move in the same direction and at the same speed.

This movement is toward the right (as shown in the illustration), and continues until the beveled end of the latch comes in contact with the pin *N* in member *L*, at which time the latch is forced upward and out of engagement with the projection on the conveyor chain. Thus released, the slide returns through the action of the coil spring *O* to its former position against stop *P*. Provision is made for holding the latch in engagement during the soldering stroke by means of the cam-plate *R* secured to member *L*. A roll, which is pivoted to the latch, remains in contact with the cam-plate until the latch is about to be released.

The solder is fed to the casings intermittently through the opening and closing action of the two feed-rolls *H* and *I*. This action is obtained by means of a camshaft which passes between and at right angles to the feed-roll shafts. This can be more clearly understood from Fig. 3, corresponding reference letters being used in all illustrations. The camshaft is indicated at *S*, and in the position shown, the rolls are in contact with the solder, so that it will be fed through the tube as the rolls rotate. Roll *I* is mounted on a shaft that extends down through the slide, and at the lower end of this shaft is secured a pinion gear which is always in mesh with the rack *T* fastened to member *L* (Fig. 2). Roll *H* is an idler, and is mounted in the floating bearing *U*. This bearing is equipped with a coil spring which provides the necessary gripping pressure on the solder while it is being fed.

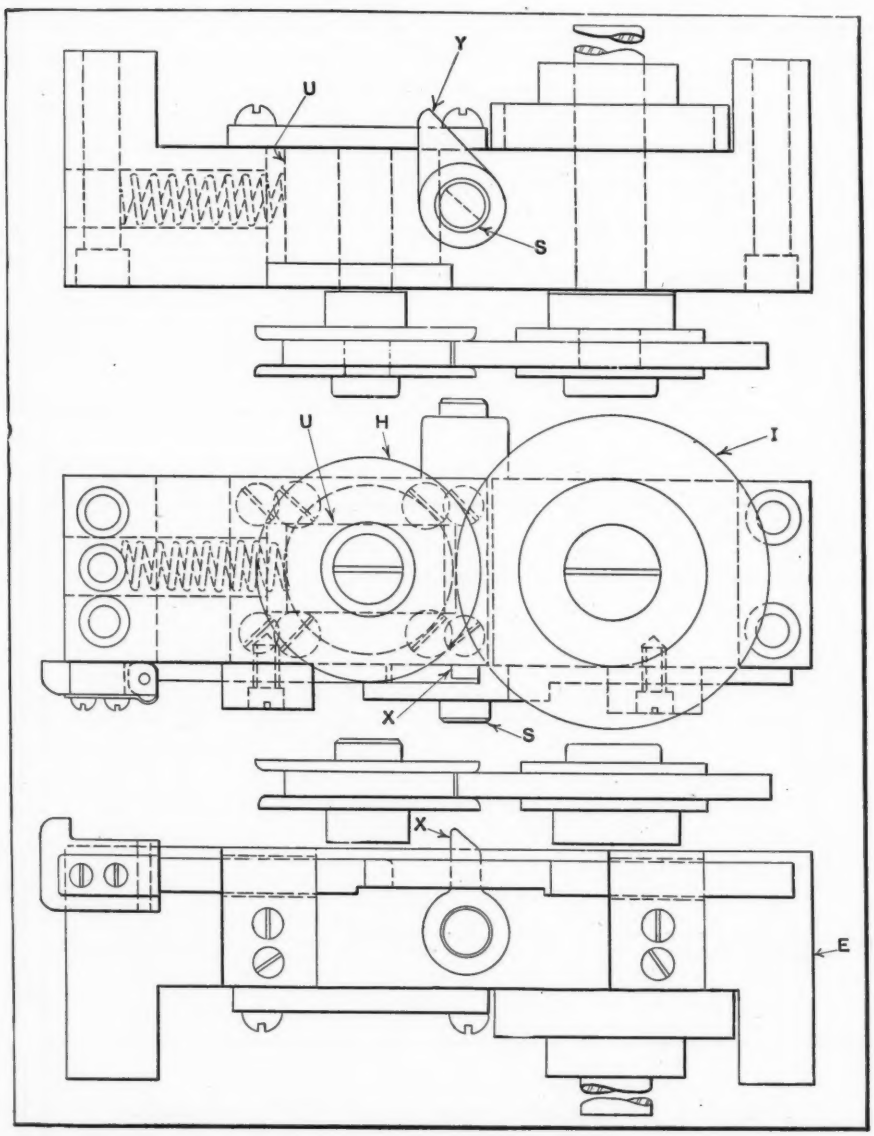


Fig. 3. Construction of Feed-slide on the Fixture Shown in Fig. 2

Functioning of Fixture

As one of the casings on the conveyor comes opposite the left-hand end of slide *E*, the roll on lever *V* (Fig. 2) comes against the cylindrical surface of the casing and causes the other end of the lever to force the sliding bar *W* to the left. This, in turn, causes the bar, which engages the dog *X* (Fig. 3) pinned to one end of camshaft *S*, to rotate the camshaft and allow the floating bearing and idler roll *H* to move to the right under the pressure of the coil spring. In this position, the solder is gripped tightly between the revolving rolls and is fed through the tube and on the casing joint.

In the meantime, the latch *M* (Fig. 1) has engaged the projection on the conveyor chain and the pinion *B* has moved into mesh with the rack *A*, so that the feeding of the solder and its movement parallel to the chain, as well as the rotary movement of the casing, take place simultaneously. The three movements continue until the entire casing joint has been soldered.

Just before the end of the stroke has been reached, however, a dog *Y* (Fig. 2), attached to the camshaft on the conveyor side of slide *E*, engages a stop *Z* secured to the slide gib on member *L* and rotates the camshaft. Rotating the shaft in this manner causes its cam surface to force roll *H* to the left, thus releasing the solder. Whipping back of the solder wire is prevented by means of the two auxiliary rolls *F* and *G*, the latter being equipped with a ratchet wheel and pawl, so that it can be rotated in a clockwise direction only.

Directly after the feeding action of the solder has been discontinued, latch *M*, by coming in contact with pin *N*, is disengaged from the conveyor. This allows slide *E* to return to its original position against the cushioned stop *P*, the latter absorbing most of the impact of the slide. This completes one cycle, which is repeated as each casing on the conveyor passes the fixture.

Provision is made for varying the amount of solder fed by adjusting stop *Z*. Timing of the contact of lever *V* with the casings is accomplished by swinging the auxiliary portion of the lever to the required position and clamping it in place by means of the cap-screw shown.

High-Temperature Resisting Alloys

THE recently developed high-temperature and high-stress resisting alloys that have been playing a vital part in jet propulsion and gas turbine engines for military aircraft are likely to have many important post-war applications not necessarily confined to aviation.

According to the research department of the Allegheny Ludlum Steel Corporation, many facts about these new alloys are still shrouded in military secrecy. Their analyses cannot be published. Exact performance data are a secret. It can be said, however, that to meet the requirements for the turbine buckets in jet propulsion motors, alloys have been developed that withstand stresses in the neighborhood of 15,000 pounds per square inch at temperatures up to 1500 degrees F. These alloys are corrosion resistant, and can be readily forged into the desired shape. They have a satisfactory life under severe operating conditions.

Many alloys were in common use before the war which could withstand high temperatures, but few of these could be used at high temperatures when under great stress. The materials in valves for internal combustion engines withstood temperatures not far below those required in gas-turbine bucket performance, but the stresses were relatively low. Before the war, the highest temperatures at which small sections had to withstand great stresses were met with in steam turbine practice, where temperatures up to 950 degrees F. were encountered.

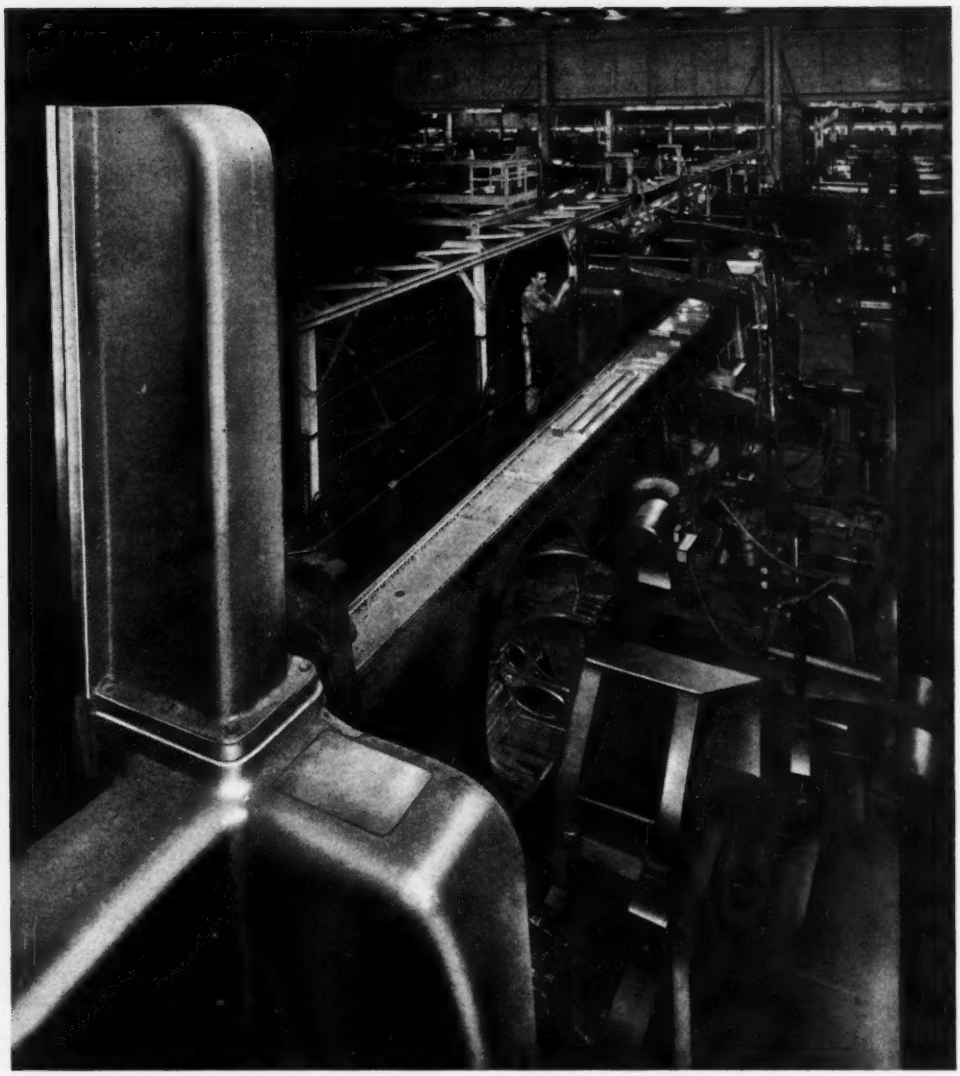
In 1938, the Allegheny Ludlum Steel Corporation began to experiment with materials that would stand similar stresses at higher temperatures. New alloys were developed as greater performance was demanded. The extent of the accomplishment can best be measured by noting the performance life of these alloys at 1500 degrees F. and at stresses up to 15,000 pounds per square inch. The best pre-war material had a life of only 100 hours under these conditions. The first important stage of the development resulted in an alloy with a life of 1000 hours; in the second development stage an alloy was produced that was good for 1500 hours; and finally, in the third stage, a life of 9000 hours was achieved.

In any study of peacetime applications of these materials, the cost must be considered. When a material is needed to win a war, the cost is a minor consideration. If the material is really important, it does not matter what it costs. In peacetime applications, however, costs are vital. As in the case with most new products, it is reasonable to assume that the eventual costs under peacetime conditions will be considerably lower than the present ones. It is impossible to predict future prices and costs, but it is certain to say that for these materials they will be lower, and this, in turn, will greatly broaden the field of their application.

* * *

Course in Quality Control by Statistical Methods

The University of Iowa has conducted two courses in quality control by statistical methods, one in October, 1944, and another in May, this year. These courses were so well received that it has been decided to give another ten-day intensive course on this subject from November 6 to 16 at the university. For further information, communicate with Earle L. Waterman, co-director of the Quality Control Program, University of Iowa, Iowa City, Iowa.



Machine Grouping Eliminated Center-Wing Bottlenecks

Eight Machine Tools Set up as One Unit for Drilling, Reaming, Boring, and Facing Operations on Airplane Center Wings Constituted One of the Outstanding Manufacturing Features at the Willow Run Bomber Plant

THE Willow Run bomber plant, which was built and operated by the Ford Motor Co., blazed new trails in aircraft manufacturing technique by the adoption of certain high-production methods that were based on the experience of the concern in automotive manufacture. One of the outstanding machine set-ups, and one that was long held secret by the War Department, was a group of eight Ingersoll-built machines employed for doing the work previously accomplished in 126 separate drilling, boring, reaming, and milling operations on center wings. These operations originally required thirty-two hours. The group of machines does all the work in thirty minutes. They were termed the "key to center wing production," because the completion of center wings on schedule depended largely upon their output.

One of the center wings, approximately 56 feet in length by 8 feet in width, is seen in the heading illustration set up in readiness to be operated on by the group of machines. The eight machines are mounted on one huge floor plate, as well as four towers or columns at each end of the installation. This insures accurate alignment of the various machines or columns in relation to each other. The columns are fitted with arms having modified V-blocks for supporting the ends of the center wing, the V-blocks being shaped to suit the wing construction. Two plungers enter reamed holes in both ends of the center wing to insure accurate location of this large work. The wing is clamped on top.

The machines are arranged on both sides of the center wing, and the machines at one end of the wing are duplicates of those at the other end. These machines drill thirty-two holes in eight motor-mount pads; ream thirty-two holes in eight motor-mount pads; drill eight holes in eight motor-mount brackets; ream eight holes in eight motor-mount brackets; mill eight surfaces on the upper motor-mount pads; mill eight surfaces on the lower motor-mount brackets; semi finish-bore ten landing gear bores; finish-bore ten landing gear bores; and face ten surfaces around the landing gear bores. This makes a total of 126 operations. Four men run the eight machines. All together, there are eighty some motors on the machines.

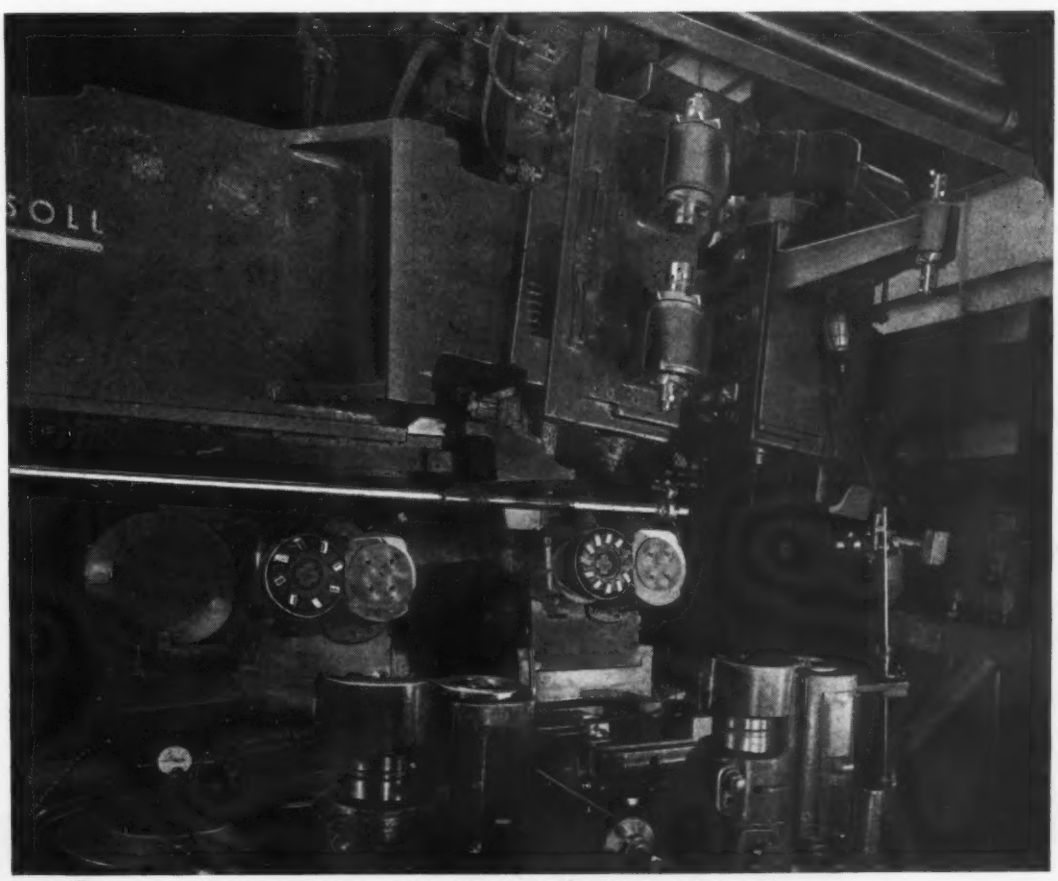
The first step after setting up a center-wing section consists of milling the motor-mount pads and brackets. These cuts are taken by machines equipped with cutter-spindles such as seen in Fig. 1; this photograph was taken with the wing section removed, so as to give a full view of the cutters.

Adjacent to the milling spindles may be seen jig plates mounted on multiple-spindle heads for guiding the drills and reamers employed in drilling 3/8-inch holes in the upper motor-mount pads. The drills and reamers are carried on the same spindles and are fed successively to the holes. Side views of these multiple-spindle heads may be seen in Fig. 2.

Both the milling spindles and the multiple-spindle drill heads are mounted on slides that are set about 10 degrees from the horizontal. The cutter-slides are adjustable vertically, and can be accurately positioned by the use of dial indicators, which insures precise locating of the drilled and reamed holes.

On the same machines, and more clearly seen in Fig. 2, are spindles for milling the lower

Fig. 1. Close-up View of One of the Machine Units Used in Milling, Drilling, Boring, and Spot-facing Center Wings



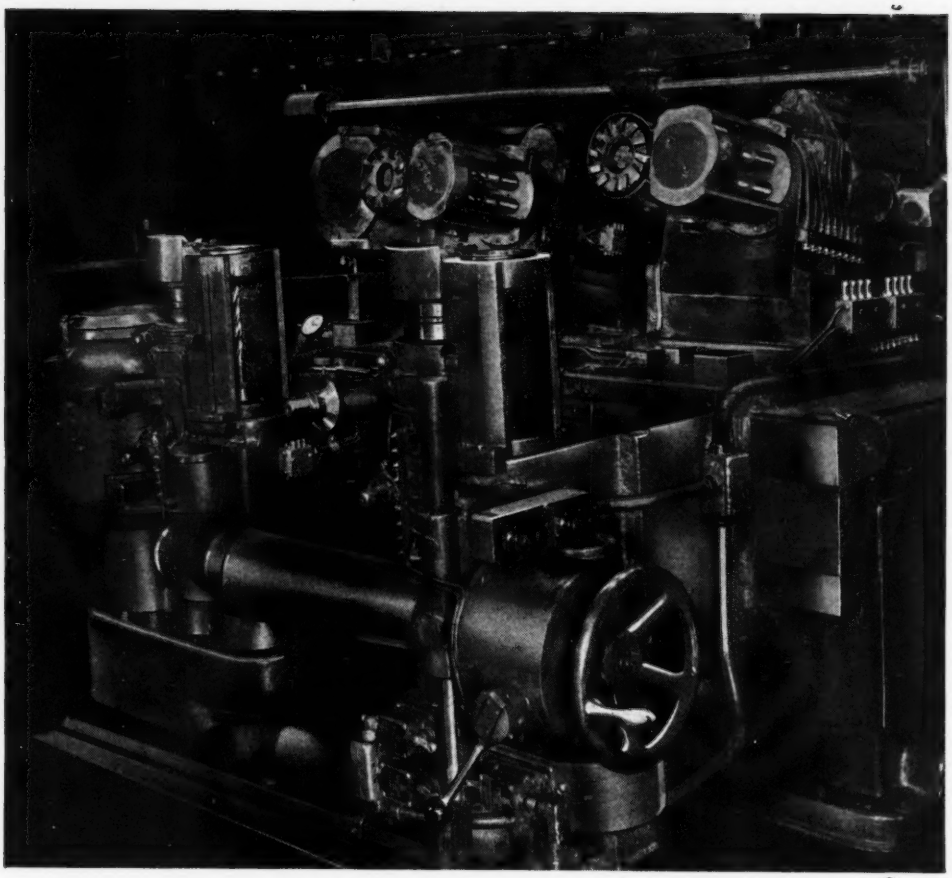


Fig. 2. Another View of Some of the Cutters and Other Equipment Provided on One of the Machines Shown in the Heading Illustration. The Center Wing has been Removed to Give a Clear View of the Cutters

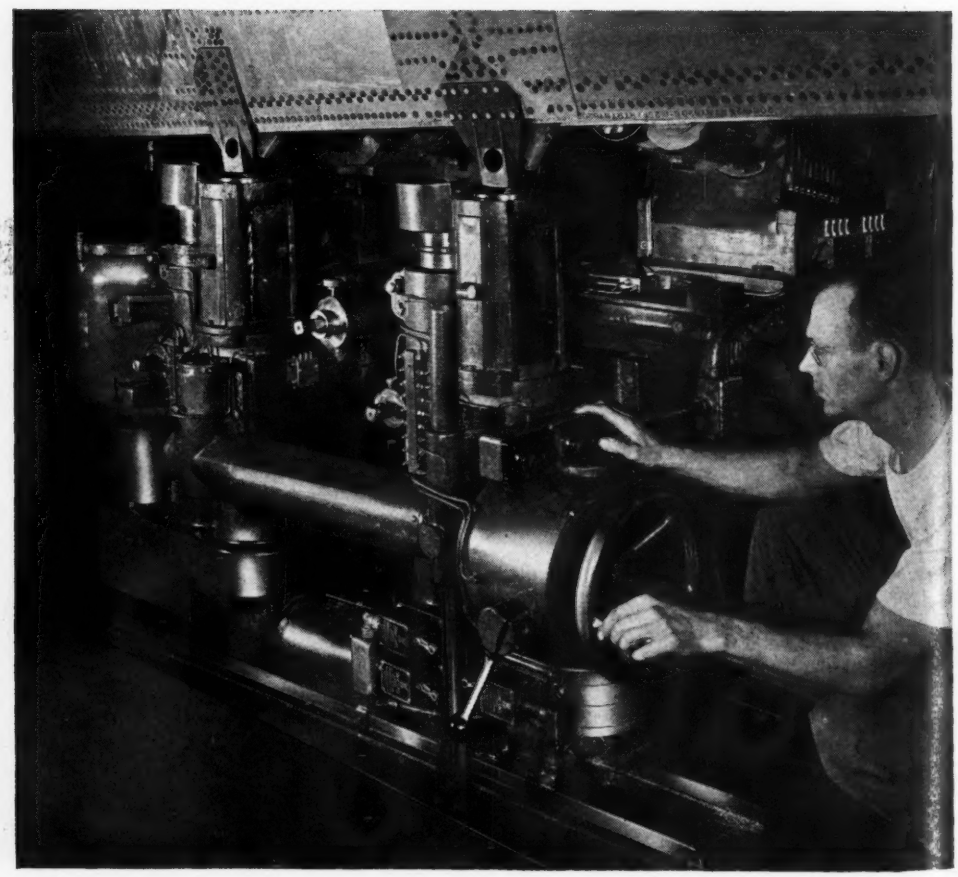


Fig. 3. Center Wing in Position, Ready for Drilling of the Lower Motor-mount Brackets after They have been Face-milled by Cutters on Spindles Parallel and Adjacent to the Drill Spindles

Fig. 4. Operating One of the Machine Heads Employed for the Boring and Spot-facing Operations on the Landing Gear Bores

motor-mount pads and drilling 13/16-inch holes through these pads. Fig. 3 shows one of the same machines with a center wing in place and the operator ready to feed the drill spindles upward.

At the top of Fig. 1 are illustrated several facing and boring tools mounted on heads that are positioned at an angle of about 5 degrees 22 minutes from the vertical. These heads are employed for spot-facing operations on the landing gear bores. It will be seen that one of the spindles is mounted on an arm of considerable length, so that it can enter the interior of the wing for spot-facing. The heads can be moved along the machine until they are positioned opposite openings in the wing, then fed into the wing to the proper operating position, and finally fed up and down in succession for boring and spot-facing. In Fig. 4, these machines are seen with a wing in place.

Four of the landing gear bores are machined to receive needle bearings. The limits on the bore diameters are 2.998 and 2.999 inches. On the main bearings, the tolerance is plus nothing, minus 0.002 inch. The center-to-center distance between the needle bearing bores and the main bearings must be held to 43.433 inches within an extremely close tolerance.

A Manual on Needle Bearings

What is virtually a handbook on needle bearings—a combined catalogue and engineering and application data reference volume for designers and engineers—has been published by the Torrington Co., of Torrington, Conn., and South Bend, Ind. The book, which comprises 153 pages, 8 1/2 by 11 inches, is entitled "Torrington Needle Bearings," and supplies a wealth of engineering information on the various needle bearings made by the company.

The section on application data, illustrated with line engravings, shows a wide variety of uses in the aircraft, automotive, farm equipment, machine tool, materials-handling, oil, power, steel, and textile industries. The data includes information on tolerances, load capacities, design factors, installation, inspection, etc. The manual is available from the Torrington Co. to engineers and production executives.

* * *

You cannot help men permanently by doing for them what they could do for themselves.

Milling Cutter Saves Ten Thousand Man-Hours a Year

Designed Especially for a Particularly Difficult Milling Operation on Aircraft Landing-Gear Struts, a New Cutter has Resulted in Time and Material Savings, as well as in a Better Product

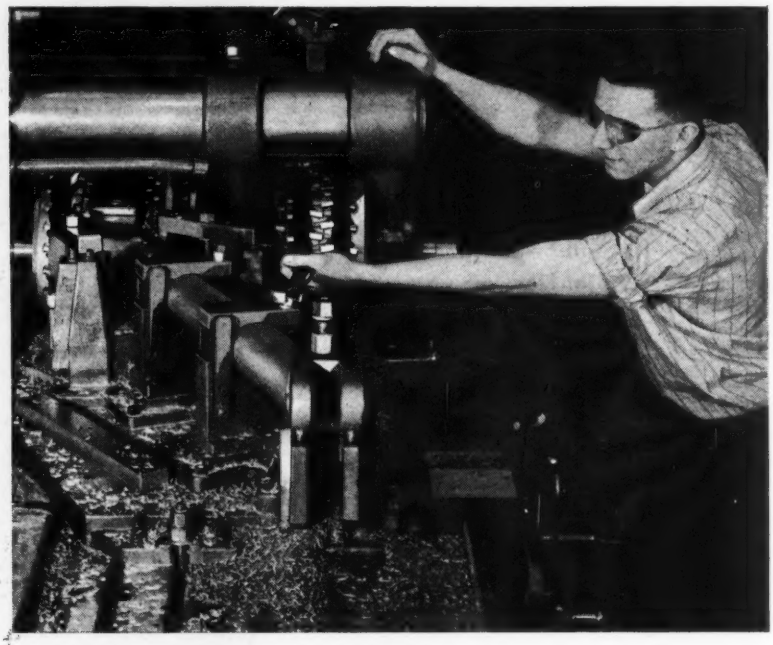


Fig. 1. Tightening Aircraft Landing-gear Strut in Preparation for Milling Operation with New Design of Cutter

A NEW type milling cutter, perfected after long study by the Gairing Tool Co., Detroit, Mich., for use at the Kenmore plant of the Curtiss-Wright Corporation, has pared more than ten thousand man-hours from production time during the past year in milling landing-gear struts for the C-46 Commandos. These huge cargo planes, built by the Curtiss-Wright Corporation's Airplane Division plants at Buffalo, St. Louis, and Louisville, were credited by General Arnold with being responsible for approximately half the tonnage carried by ATC over the Hump to keep the vital life lines in the China-Burma-India theater open.

In April, 1944, Ted Rochester, machine shop superintendent of Curtiss-Wright's Kenmore plant, set out to increase production on straddle-milling, which was then two to five pieces per cutter grind. Several cutter manufacturers were invited to go to the Kenmore plant at Buffalo, where, working in conjunction with Curtiss engineers, the problem was studied from various angles. The first result of these studies was that production was stepped up to from thirteen to seventeen pieces per grind—a sizable increase. Some time afterward, however, a much greater increase was obtained by the introduction of a new design of cutter developed by the Gairing Tool Co. Almost at once the speed of the milling operation was increased from 16 to 22 R.P.M. and the feed from 5/8 to 3/4 inch. The production rate moved rapidly upward until an average of from thirty to forty pieces was attained for each cutter grind.

In producing the new inserted-blade milling cutters, a type of blade and locking member were incorporated designed to assure greater utility, strength, rigidity, and freedom from blade tilting. The outstanding feature of the design was the provision for locking the blade inserts at the back, so that ample chip clearance could be milled in the cutter body in front of each blade. These clearance cavities also serve to retain an appreciable amount of coolant, which flows out onto the cutter blades as the milling cutter rotates. The small size of the blade-holding member permits close spacing of the teeth, and consequently, a greater number of cutting edges can be provided for a given cutter diameter.

Each cutter blade has a rake angle of 10 degrees, a helix angle of 10 degrees, and a front clearance angle of 4 degrees. The blades are dished 0.003 inch per inch on each side, and have a 5-degree side clearance. Between 1/8 and 3/16 inch of metal is removed on a side. The cutters mill approximately 1/2 inch deep into the solid yoke of the landing-gear strut.

The blade locking is securely and effectively accomplished by having the locking member fitted to the serrated-blade member in such a way that the blade always rests on the bottom of the slot after holding adjustments are made. Pressure exerted on the blade during the cutting action has the tendency to wedge the blade

more tightly in its slot. Of course, inserted-blade cutters of this character which are used for taking heavy cuts on hard material in quantity production must, themselves, be of sturdy design in order to utilize the milling machines to their full capacity and to assure continued production.

Appreciable economy of operation has been achieved with the new cutters, particularly in the use of coolant. Before these cutters were introduced, a straight cutting oil was used. This was replaced by a soluble oil, with a consequent saving.

Not only has economy in operation been effected since the new cutters were introduced, but the quality of the machined struts has actually improved. A smoother finish, along with greater durability, has been achieved.

Where it took 186 minutes formerly to mill one strut, the present time has been reduced to 116 minutes—a saving of 70 minutes on the operation. So, along with increased production of struts, an approximate saving of 30 man-hours daily has been achieved.

* * *

Humidity a Cause of Trouble in Abrasive Wheel Drying Rooms

Excessive humidity in polishing and abrasive wheel drying rooms is the cause of a great deal of trouble with glue. The moisture in the air prevents the glue from setting and holding the abrasive properly. The solution of this problem is dehumidifying. Every polishing or wheel room should be equipped with some means for reducing the humidity in the air.

Fiftieth Anniversary Convention and Exhibit of Foundrymen

The American Foundrymen's Association, 222 W. Adams St., Chicago 6, Ill., is planning to hold its fiftieth anniversary convention and foundry show in the Auditorium, Cleveland, Ohio, in May, 1946. In connection with this event, an International Foundry Congress is planned, which will be attended by foundrymen from Europe, South America, South Africa, and Australia. This will be the third International Foundry Congress sponsored by the American Foundrymen's Association; the first one was held in Detroit in 1926, and the second in Philadelphia in 1934.

At the 1946 meeting and exhibit, it is expected that there will be available to the entire foundry industry many outstanding and hitherto secret developments that have played an important part in the winning of the war and that will be equally important in the development of peacetime industrial products.

* * *

Booklet on Employment Opportunities in Industrial Design

Designers for Industry, Inc., 2915 Detroit Ave., Cleveland 13, Ohio, have published a 12-page booklet entitled "Your Opportunity in Planned Products Service," which is addressed to discharged service men, as well as to others "with ambition, ability, and imagination." This booklet may be had for the asking from Designers for Industry, Inc.

Fig. 2. Group of Cutters in the Background Finish-milling Terminal on Aircraft Landing-gear Strut. Method of Fastening Inserted Cutter Blades and Deep Chip Clearance Cavities are Plainly Visible in Cutters in Foreground

Ingenious Applications of Steel Balls in Machine Design

THE use of steel balls in such devices as clutches, ratchets, and extractor tools is well known. That hardened steel balls of the type employed in ball bearings can be used advantageously by engineers and designers in devices developed for a wide variety of purposes is indicated by the applications shown in the illustrations Figs. 1 to 20. These illustrations, together with the brief descriptions that follow, are presented here with the hope that they will be found useful to mechanical engineers and designers generally.

Fig. 1—In special-purpose machinery, there are usually a number of slides, oscillating arms, and pushers, which are frequently put on rollers as depicted.

Fig. 2—This shows an ordinary ball valve, and is self-explanatory.

Fig. 3—On machinery that has to work with powders or substances that contain salts, it is advisable to keep the bearings clean. With this in view, the manufacturers of such machinery usually cast facings on the various arm bosses and provide a ball type lubricator. Machines so fitted show no appreciable wear.

Fig. 4—This illustration shows a steel ball used as a pivot for a clamp plate. The device is employed in conjunction with tool-holders that are designed to hold cutters made of tungsten, corundum, etc.

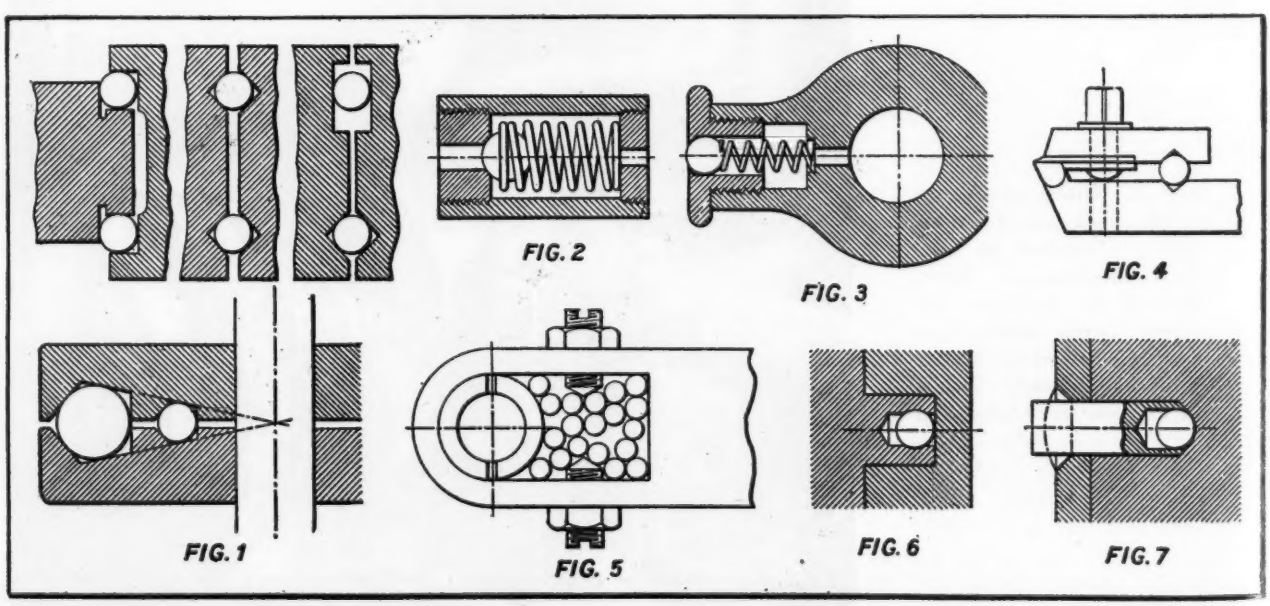
Fig. 5—Here is shown a method of taking up wear in bushings, used by engineers in machines that deal with salt-like substances. It can be seen from the illustration that by the adjustment of the two screws, the balls are displaced and so force the brass bushing up to the shaft.

Fig. 6—This illustration shows how two parts can be fastened together without any external projections. The ball in this instance is forced into the hole, which is usually 0.030 inch smaller in diameter than the ball. By this action, the ball forces out the hub member and produces a tight fit between the two parts. This method is very useful when pins have to be fastened in small gear wheels, operating handles, or knobs, and similar parts.

Fig. 7—Here is a case similar to that shown in Fig. 6. The two assembled members are interfitting sheets of metal. The hole in the rivet is made 0.030 inch smaller than the ball diameter, and when the rivet is forced in, the resultant bulge or expansion suffices to pull the two plates tightly together.

Fig. 8—This is a very useful method of transmitting power when the two shafts do not lie in the same straight line. The two shaft ends, which are cupped and hardened, are pulled together by a strong coil spring. This drive will stand up under fairly rough usage.

Fig. 9—In designing light machinery where



Figs. 1 to 7. Some Interesting Applications of Hardened Steel Balls

the space is limited, the problem of transmitting motion around corners is frequently encountered. In such cases, there may not be sufficient room for the usual connecting-rod ends. To overcome this difficulty, a method utilizing the steel ball has helped many designers. The balls are mounted with a good fit in the bent tube, and the motion of one rod is transmitted to the other by the balls. The frictional loss in the transmission is very low.

Fig. 10—This is a cheap but efficient method of applying a ball bearing to a spindle. The spindle is turned to form one side of the support for the balls that serve as the bearing, and a loose hardened steel bushing with a V-groove is forced into the main casing. A loose hardened steel bushing with a tapered end is placed on the shaft to form another ball support. This sleeve also carries a collar-like projection, which serves as a tightening face for a loose, thick washer which, in turn, is forced into place by means of a nut and washer.

Fig. 11—A steel ball is used as the thrust bearing and support for a light transmission shaft. It is much used in naval ordnance instruments. The ball is held in the cup-shaped cavity of a hardened screw, which is adjusted to apply the required pressure. When the correct position has been found, the set-screw is tightened.

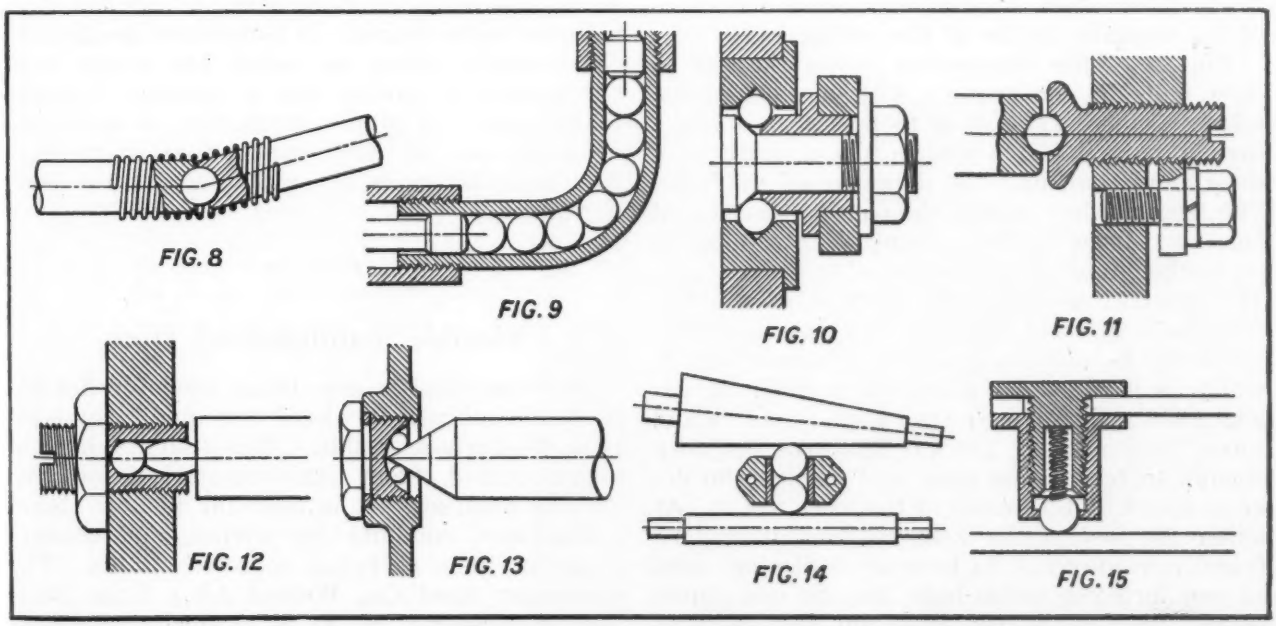
Fig. 12—In designing instruments to be made by unskilled labor on a mass production basis, one must make allowances for small inaccuracies. This illustration shows the design of a bearing that has been used under such conditions. The spindle end is formed to a barrel shape, and is free to turn in the end of the pivot screw. A steel ball at the bottom of the hole in the pivot screw serves as a thrust bearing for the spindle. When long life is of less importance than low cost, this method can hardly be surpassed.

Fig. 13—This illustration shows a rather useful application of a number of steel balls arranged to form an anti-friction bearing. This arrangement is fairly common practice on instruments and similar mechanical devices. The nut and ball seat is usually made in one piece, hardened and polished. The pointed inserted end of the spindle is made of hard material and forced into the end of the spindle.

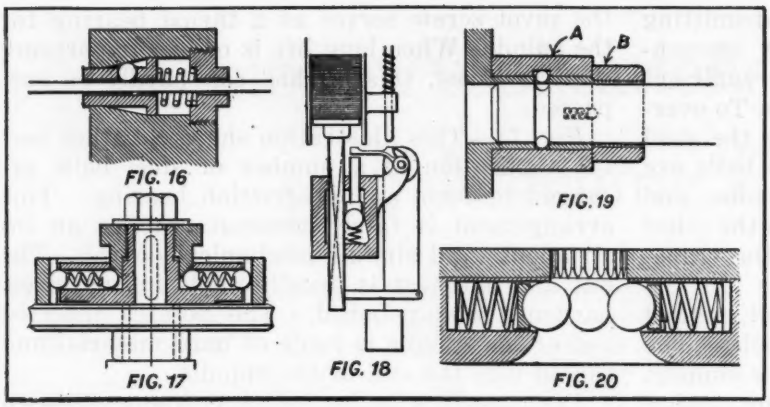
Fig. 14—This device, which is frequently used in friction gear transmission, has a high efficiency. The output and input shafts are linked together by a member that carries two or more steel balls which revolve between Nitralloy strips. Given the proper care in fitting and correct materials, this transmission gives almost 100 per cent efficiency.

Fig. 15—The steel ball finds a useful field in the machines that deal with fabrics, paper, etc. During the manufacture of cloth or paper the material is rolled, and it is essential to conduct it in a central path. In the illustration is shown a warning device that makes use of a steel ball. The ball is usually spring-mounted, and the fabric passes between it and the work-table. If by any chance the fabric moves laterally out of its path or breaks, the ball will come into contact with the table, and thus close an electrical circuit that operates a warning lamp or bell.

Fig. 16—This illustration shows a steel ball applied to the in-feed of a wire-working machine. The action of this feed is similar to that of a ball ratchet. The housing is made to slide in the same direction as that in which the wire



Figs. 8 to 15. Methods of Employing Steel Balls of the Type Used in Ordinary Ball Bearings



Figs. 16 to 20. Five Mechanisms or Devices in which Steel Balls are Used

is fed. This movement causes the balls, usually four, to ride up and down the taper, so that they grip the wire and draw the required amount into the machine.

Fig. 17—This illustration shows the application of steel balls to a slipping clutch. The main drive-gear is loose on the spindle and carries recessed lugs which are shown in section. Between two disks are a series of spring-backed balls, on which the tension is adjusted by means of the inclined face of the adjusting nut.

Fig. 18—This illustration shows a part of a label-feeding device. The platform that carries the labels is forced upward by a weight. To prevent the platform from rising except as required, a spring-mounted ball is provided. In use, the label magazine functions as follows: A label is fed from the top by means of a vacuum cup; which on its downward stroke strikes the spring finger. This pushes against a lever, which, in turn, operates the ball finger. The ball finger forces the ball into the wider part of the tapered chamber, permitting the platform stem to move upward. After the label has been removed, the platform stem is locked once again by means of the wedging action of the spring ball.

Fig. 19—This illustration shows the use of steel balls in conjunction with a quick-action release device. The stem to be released has a turned groove. This groove has a depth of a little more than half the diameter of the balls. The bearing that carries the part to be released has two holes drilled diametrically opposite each other, into which are placed two steel balls. The illustration shows the position of the two steel balls in their free and working positions. When in the working position, the loose nut *A*, which is retained by means of a collar *B*, engages the balls on their true bore diameter and forces them into the groove. Two recesses, deep enough to receive the balls, are formed 180 degrees apart on the inside of the loose nut *A*. At either the fast or the loose position, it may be found advantageous to have an indicator, such as two spring-mounted balls like the one shown dotted, installed in the loose nut and made to engage two indents in the collar.

Fig. 20—In this illustration are shown steel balls used in bottle capsuling machines. After the rough blank has been formed, it is placed above the bottle neck and is then ready for passing through the capsuling die. It is by the means of three or four spring-backed balls that the bottle is centralized during its upward travel to the die head.

* * *

"Synkrete"— A Liquid Developed for Dustproofing Concrete Floors

Many industrial plants troubled by dusting cement floors are overcoming this difficulty during reconversion. While the equipment is being changed or shifted, it is a simple matter to treat the floors in such a way that dusting will be eliminated. A liquid known as "Synkrete," made by the Synthex Products Co., 2 W. 45th St., New York City, is used for this purpose. This liquid is a concentrate, which is diluted with three parts of water before being used. It is applied with a brush, mop, or sprinkler to saturate a given area. It penetrates deeply into the concrete, filling the pores, and reacts with the cement to harden into a rock-like impenetrable mass. A single application is sufficient, although two or three applications at twenty-four hour intervals are recommended for lasting results.

* * *

Flexible Stainless-Steel Hose

Stainless steel is now being used for flexible hose in applications where this quality of steel is particularly desirable. This stainless hose is manufactured from stainless-steel tubing of various analyses. It is used for flexible steam connections, conduits for wiring, and connections on lines carrying corrosive fluids. The Carpenter Steel Co., Welded Alloy Tube Division, Kenilworth, N. J., is producing stainless tubing for manufacturers of stainless-steel hose.

Battery of Thirty-Two Automatics with Chip and Product Conveyor

THE battery of thirty-two "Poly Choke" single-spindle automatic screw machines shown in Fig. 1 is designed to obtain high production. These machines are mounted on a long bench, with a spacing of only 24 inches between spindle centers. All machines can be set up to handle the same piece or any desired number can be set up individually for different pieces and kept in continuous production with a minimum of attention.

The bar stock is fed to the machines in long lengths from wooden boxes at the rear of the machines, which serve for storage, as well as for guiding the work. The finished pieces can be dropped into individual boxes at each machine or, as in the case shown, a chain belt conveyor can be used to deliver the pieces into a tote box at the end of the line. The conveyor belt also carries the chips to the end of the line, where they are deposited into a large pan and allowed to drain.

A central pump having a capacity of 100 gallons per minute delivers coolant to all machines at any desired pressure through a main line pipe running the length of the bench. The cutting oil drains through the conveyor chain back to the center of the bench and into a large tank holding the main supply of 300 gallons.

Installing these machines or units in batteries on a bench in the manner shown eliminates the cost of cast-iron pans or bases and individual pumping units, as well as effecting a large saving in floor space. An unskilled girl operator can tend five or more machines, depending on the length of the machine cycle required for the particular parts being produced.

These machines, shown in front and side views in Figs. 2 and 3, are manufactured by the Poly Choke Co., Hartford, Conn., to meet the demand for inexpensive automatics adapted for the production of comparatively simple parts from bar stock. The regular machines handle bar stock up to 1 inch in diameter, and will produce parts up to 4 inches in length, such as studs, rolls, pins, dowels, and wrench keys. By employing a weight type stock feed, studs, axles, shafts, and other formed parts up to 7 inches in length can be made. Simple drilling attachments are also available for use in the production of bushings, nuts, etc.

Any standard tools, such as circular, dovetail, flat, and cutting-off tools, can be mounted on the tool arms. End-working tools can also be used in a simple attachment consisting of a spindle, quill, lever, and cam. This equipment is installed by removing the stock stop and replacing it with the quill and spindle of the attachment, the cam being mounted on the end of the camshaft. The tool arms are radially operated at a 1 to 1 ratio directly by two cams on the camshaft.

A feature of these machines is the infinite number of feed changes obtainable without the use of gearing. This is accomplished by means of two opposed eccentric disks, mounted on the spindle with a spacing of 180 degrees. These

Fig. 1. Thirty-two "Poly Choke" Automatic Screw Machines with Conveyor for Work and Chips and a Central Coolant Supply System

disks are graduated to facilitate adjustment for any cycle or feed per revolution desired. Two levers, operated by the eccentric disks or cams on the spindle at each side of the driving pulley, are mounted on the camshaft, which they drive through two roller clutch units, each of which has eight friction driving rollers. The roller clutches rotate the camshaft at two impulses per revolution of the spindle, thereby transmitting the intermittent feed movements directly to the cutting tools. This intermittent feed serves to break up the chips, so that they can be handled effectively by the conveyor system.

When the stock-feed pusher is drawn back off the end of the bar, the machine is mechanically stopped, the collet opened by disengaging the feed control handle, and a signal flashed by the pilot light to inform the operator, who can then restock the machine from the front side by means of a stock loading handle.

Spindle speeds ranging from 225 to 3000 R.P.M. are available on these machines. The machine cycles range up to thirty per minute. For low spindle speeds, the machine is equipped with a 1 1/2-H.P., 900-R.P.M. motor; for high spindle speeds, a 3-H.P., 3600-R.P.M. motor is used; while for intermediate speeds, a 1 1/2-H.P., 1800-R.P.M. motor is employed. The complete machine weighs about 600 pounds.

This is one of the many unusual developments that took place during the war period and are now available for peacetime production.

Veterans' Refresher Courses

Returning veterans who entered the armed services from the metal industries are offered an extensive program of free refresher courses by the American Society for Metals. The object of these courses is to bring these men up to date on new developments and processes in the industry. The courses will be handled by the sixty-eight local chapter groups of the Society. Each chapter will select a committee composed of experts in the field to be reviewed, and each veteran will be given personal attention.

These courses will not be educational school courses in the usual sense, but rather small group meetings or conferences designed to serve the specific needs of the individual veteran. The service is free and available to all veterans returning to the metal industry, whether they are members of the Society or not. Further information can be obtained from W. H. Eisenman, national secretary, 7301 Euclid Ave., Cleveland 3, Ohio.

* * *

Coated abrasives are not a new idea in industry. Sand and glass were glued to paper on a commercial scale in England as long as 350 years ago, and in 1825 the first sandpaper factory was established in the United States, making glass-coated sandpaper.

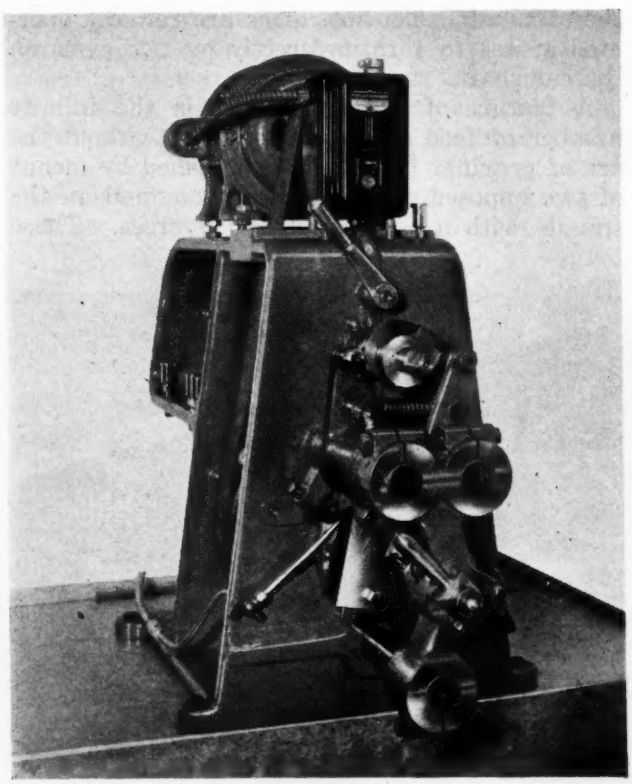


Fig. 2. Front View of "Poly Choke" Automatic Screw Machine

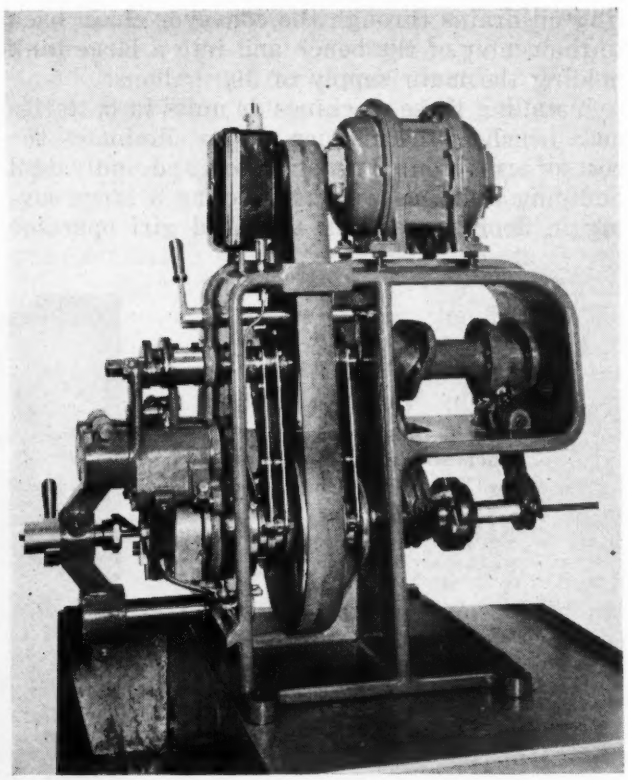


Fig. 3. Right Side View of Screw Machine Shown in Fig. 2

Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

Class of Material	Trade Name	Properties	Applications
Tinning Flux	**Airco Hi-Bond**	This flux overcomes the difficulties encountered in tinning cast iron, and makes possible highly satisfactory tinning, especially of cast iron having high carbon and silicon content or low combined carbon analysis.	For tinning cast iron prior to brazing. Does not replace the regular flux used for brazing.
Lubricant	**Air Luboil**	In addition to the basic oil, a detergent is provided to clean all moving surfaces. A dispersing agent prevents oxidized particles of oil sludge from being deposited on the bearing surfaces.	For use in air-driven tools.
Flat Steel Stock	**Air Tru**	A flat ground stock that is air-hardening and non-deforming. This stock machines well and can be readily filed and finished in fine die work. A black oxide finish permits scribing without use of lay-out dye.	Especially designed for use where close tolerances must be maintained through heat-treating operations, as in making jigs, gages, fixtures, tools, punch and die facings, and small precision parts.
Zinc-blackening Compound	**Alronox**	A process in which Oxidine Z salts are used to blacken zinc by immersion.	Used for blackening and protecting zinc surfaces.
Bronze Rod	**Ampcoloy 342** **Ampcoloy 382** **Ampcoloy 742**	Three continuous cast bronzes in rod form. These bronzes have an extremely uniform structure, with lead or other secondary constituents uniformly dispersed and in a finely divided state throughout. Dirt, dross, and shrinkage cavities are excluded by the nature of the continous casting process.	For use in semi-automatic and fully automatic screw machines.
Coating for Zinc Surfaces	**Anozinc**	An anodic process which imparts a corrosion-resistant coating to zinc-plated surfaces and zinc-base die-castings. Two finishes are available — a black and a brassy, slightly iridescent yellow.	For protection of zinc surfaces.
Anti-fog Compound	**AO**	This compound, when applied to glass, leaves a thin film which prevents fogging, steaming, or frosting. It also removes grease and dirt from glass.	For keeping goggle lenses, face shields, and welding plates clear.
Welding Flux	**Autochemic Eutector**	Metal parts are coated by immersion in diluted solution.	For preventing metals that are to be heat-treated from becoming tarnished.
High-impact Plastic	**BM-16468**	A high-impact resistant molding material with string filler. Impact resistance is twenty to twenty-five times that of general-purpose phenolics.	For plastic products requiring high impact strength.
Synthetic Rubber	**Buna N 233-5**	Retains a tensile strength of over 1000 pounds per square inch and an elongation of over 100 per cent after being subjected to aircraft-engine oil at 300 degrees F. for seventy hours. Remains flexible at 40 degrees F. below zero.	Intended for use in oil-seals, oil-rings, and other applications requiring resistance to aromatic fuels.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Rust Solvent	**CarboRustex**	This solvent has an affinity for rust, but will not attack unoxidized metal. It is applied by brushing, spraying, or dipping. The solvent is non-inflammable, and is not toxic or injurious to the skin. It also provides a protection for clean surfaces against oxidation.	For use wherever rust is to be removed from metal surfaces.
Cellular Rubber Material	**Cell-Tite**	An ebony-like cellular rubber material with a high strength-weight ratio and considerable hardness. Has more buoyancy and lower water absorption than cork, a high resistance to chemical attack, and good aging properties. It can be sawed, drilled, planed, and otherwise worked, much the same as wood.	Originally utilized for airplane propeller fairings, but is now available for industrial use.
Synthetic Rubber Compound	**Chlorinated Isopol**	Synthetic rubber compound with characteristics comparable to those of chlorinated rubber.	Suitable for use as a primer for rubber-to-metal adhesion; as an ingredient in adhesives, paints, lacquers, inks, etc.; as an acid- and alkali-resistant coating for metal, concrete, and other surfaces; for fireproofing and moisture-proofing fabrics and other materials; wherever sound and heat insulation qualities are desired; and as a plastic wherever inertness to chemicals and fireproof properties are of importance.
Alkali Cleaner	**Cleaner 100**	Used in a concentration of 4 to 8 ounces per gallon at 180 to 212 degrees F. It has high detergency and rapid cleaning action at low current densities. It is equally effective in hard and soft water, and forms no insoluble residues due to reaction with acids.	Used for cleaning steel parts. May be used anodically or as immersion cleaner.
Inoculants for Cast Iron	**CMSZ 4** **CMSZ 5**	Chief among advantages derived are increased hardness and wear resistance. The new alloys also improve the tensile and transverse strength of a cast iron and greatly reduce the tendency to "grow." They impart higher resistance to oxidation and to the annealing effect of elevated temperatures.	For use as stabilizing inoculants for cast iron for providing advantages of chromium without usual increase in depth of chill. Also serve to add strong graphitizing agents.
Plastics	**Compars**	A series of plastics developed to meet the demand for flexible material to withstand the action of toluol, xylol, and benzol. Some of these plastics are chemically entirely unaffected by action of organic solvents; others exhibit low permeability to industrial refrigerant and military gases, high tensile strength and freedom from aging or oxidation. Some varieties remain flexible throughout a temperature range of minus 70 to plus 300 degrees F. Other types of plastics in this series are insoluble in water at all temperatures.	One of the major applications is hose and hose assemblies to carry gasoline, oils, refrigerant, or other toxic gases. Also used for washers, gaskets, and seals which come in contact with organic solvents.
Plastic Laminate	**Conolite**	A plastic laminate made by impregnating Fiberglas or Fortisan fabric with a new type of thermosetting resin. Has good resistance to salt water, benzine, aromatic fuels and acetone. Has a tensile strength ranging up to 120,000 pounds per square inch.	Used for fabricating various airplane structural parts.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Rust Preventive and Cleaner	**Cosmoline No. 805**	A fluid compound that acts as a combined rust preventive, finger-print neutralizer, and cleaner. It is not intended to remove rust, but to neutralize the causes of corrosion. Also effective in protecting metal surfaces against corrosion caused by chemical atmosphere, fumes, or high humidity.	For protection of steel parts between processing or machining operations.
Insulating Materials	**Dow-Corning 993 Dow-Corning 2052**	Two of a class of organo-silicon insulating materials, known as Silicones, having exceptional heat stability, resistance to moisture, and freedom from carbonization at high operating temperatures. These insulating resins make possible higher safe operating temperatures, permitting the design of electrical equipment of increased power output, decreased size and weight, and improved reliability.	Dow-Corning 993 is employed as an impregnant and coating for Fiberglas served magnet wire and for woven Fiberglas electrical tapes, cloth, and sleeving. Dow-Corning 2052 is intended as an impregnant and thermosetting dielectric for rotating parts of electrical equipment.
Basic Resin	**Duralon**	A basic resin made from waste agricultural products, such as oat hulls and corncorbs. It is characterized by low water absorption; insolubility (after activation) in any solvent or combination of solvents; high electrical resistance; absolute stability during storage and handling; and workability.	Offers excellent possibilities as an impregnant, a laminating and bonding agent, and a protective coating material. Definite molding possibilities are also indicated.
Plastic Nameplate Material	**Durashield**	A laminated cellulose-acetate plastic material which can be fabricated in various sizes, shapes, thicknesses, and colors. It can be readily engraved or embossed.	Useful as a substitute for brass and bronze nameplates, dial faces, tool checks, etc.
Valve-facing Material	**Eatonite**	An alloy of nickel, chromium, cobalt, and tungsten that retains the necessary hardness at extremely high temperatures and resists the chemical action of compounds released during combustion by high-performance anti-knock fuels.	For use as a valve-facing material in airplane, truck, tractor, bus, and passenger car engines. Application is by a welding process, which bonds alloy in a groove cut in the valve head.
Plastic	**Emeloid**	A plastic available in a variety of grades of hardness, elasticity, and toughness. Obtainable in clear form or in a variety of colors.	For making formed, molded, or shaped parts. It can be cut, sheared, sawed, punched, pierced, stamped, polished, drilled, machined, lithographed, and printed.
Synthetic Adhesives	**Fairprene, Type No. 1; Type No. 2; Type No. 3; No. 5105, No. 5106, and No. 5112**	These unvulcanized synthetic elastic compositions can be vulcanized with heat or are self-vulcanizing at atmospheric temperatures.	These cements are used to obtain adherence of various combinations of cured and uncured Neoprene stock, cured and uncured rubber, leather fabrics, and paper. Also used in sheet-metal joints of aluminum and Dural preparatory to welding; as binders for oil-resistant packings; as sealants for instrument installations and as protective coatings on wire.
Hard-facing Metal	**Fanweld**	A non-ferrous alloy for hard-facing with oxy-acetylene torch. It contains tantalum-columbium carbide, which imparts to the hard-faced surface a peculiar self-lubricating property that minimizes the destructive effects of friction, even at high temperatures.	Is especially suited for hot-work punches, dies, and tools.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Ferrous Blackening Process	**Ferrotoning**	This process utilizes simple immersion equipment, and is carried on at a temperature considerably below that required by oxide finishing. A dry or matte black finish is provided that does not chip, flake, or peel off even under repeated flexings, and cannot be removed under regular cleaning operations by the action of solvents or degreasing agents.	For blackening ferrous parts.
Fire-resistant Chemical	**Fi-Retard Liquid**	A fire-resistant chemical applied to wooden foundry molds by dipping. Dimensions of the molds are not changed.	Used for the reduction of fire hazard by making wooden foundry molds fire-resistant.
Iron Cement	**Fix-Iron**	A powder which is mixed with water and applied without heat. May be hammered into cracks or other openings. After hardening, has same expansion and contraction with temperature changes as iron.	For repairing broken, cracked, or defective metal castings and piping, making joints and seams secure, and stopping leaks in boilers, furnaces, fire-pots, and other metal equipment.
Wire Solder	**Flux-rite**	A wire solder having flux contained in outside longitudinal grooves. The flux is liquefied and flows onto the work before the solder melts, resulting in thorough and complete fluxing.	For general soldering operations.
Plastic	**Fosterite**	A tough moisture-proof plastic suitable as an impregnant. Almost as fluid as water, it fills completely every minute space in electrical coils and windings, and after setting, leaves no air gaps through which moisture can seep. It requires no liquid solvent, and fuses into an impenetrable solid when heated.	Used as a moisture-proof sealer for electrical parts.
Synthetic-rubber Sealing Compound	**Galco**	A Thiokol synthetic-rubber sealing compound of the Latex type, designed for spray, brush, or slush application. Has low diffusion rate, low solubility in aromatic fuel and water, high adhesion to aluminum, steel, wood, and other materials. It will maintain a tight seal over a wide temperature range.	Originally developed for sealing airplane integral fuel tanks, but is expected to have many industrial and commercial applications.
Hydraulic Oil Gum Solvent	**Gum Solvent B**	When used in the proportion of 3 to 5 per cent of oil in a hydraulic system, it dissolves any accumulation of sludge or gum.	For use in hydraulic systems where there is evidence of poor indexing or improper operation. It obviates flushing to clean hydraulic lines.
Substitute for Petroleum Sulphonates	**Gunk Concentrate P-96**	This compound is diluted with about three volumes of a suitable mineral oil, and extended further with water as needed.	Used as a substitute for petroleum sulphonates or "mahogany" soaps in making emulsifiers and soluble oils for cutting and grinding operations.
Flexible Metallic Packing	**Inconel**	This packing is made of nickel-chromium-iron alloy in wire form which has been knitted into a mesh and then braided. In addition to its high corrosion and temperature resistance, the new packing is strong, resilient, and both non-scaling and non-magnetic.	Developed to meet destructive conditions existing in exhaust systems of airplanes equipped with turbo-superchargers. Available in coil and tape forms for making ring type gaskets, and with interwoven asbestos fibers to serve as a sealing agent.
Protective Coating	**Insl-X**	A temporary protective coating for metal surfaces that can be applied by brushing or dipping. It is easily stripped off by hand without the use of solvents.	For protection of steel, brass, copper, aluminum, or other metal surfaces.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Color Finishes for Zinc and Cadmium	**Iridite**	An anti-corrosive final finish available in a wide range of standard colors, including bronze, black, blue-black, blues, greens, and maroons.	For coloring zinc and cadmium surfaces.
Protective Coating	**Jan-Seal**	A plastic coating applied by dipping for protection against mechanical damage and corrosion during shipment and storage.	Designed to protect gaging surfaces of plug, thread, and special gages.
Hard-facing Metal	**Kerk-Aloy**	An alloy having unusual qualities of hardness, resistance to wear, thermal conductivity, low melting point, and stability of temper. It has marked ability to bond homogeneously with any metal except lead and aluminum. Can be applied with electric arc or acetylene torch without use of bonding fluxes.	Suitable for hard-facing harrow points, steam-shovel lips, dredge lips, and other equipment where long hard service is the rule.
Protective Coating	**Koilkote**	A protective coating that reduces the frequency and length of time required to clean rustproofing system coils.	Intended especially for use on steel coils in rustproofing systems.
High-impact Plastic	**Kys-Ite K101**	A wood-pulp Durez resin-impregnated compound with low heat conductivity. It is not affected by temperatures ranging from —40 to +212 degrees F. or by oils, gasoline, ethyl alcohol, acetone, xylol, carbon tetrachloride, and pyridine.	Developed for the manufacture of marine valve handwheels.
Waterproof Coating	**Liquinoleum**	A resilent, elastic waterproof coating that is highly resistant to extremes of temperature. It is unaffected by acid fumes and most chemicals, and does not crystallize on setting. A high-temperature flame will not cause this coating to catch fire, flow, or run.	For application to roofs, walls, and other surface exposed to the elements.
Soldering Flux	**Lloyd's No. 6**	A flux with high enough capillary action to make lead-rich solders flow evenly and completely through solder joints. Provides higher tensile strength than previously obtained with 50-50 solders.	Suitable for use with 2 1/2 to 6 per cent silver-lead solders, as well as low-temperature solders. Can be applied in soldering zinc-coated sheet metal, lead-coated sheet metal, tinplate, terne plate, brass, copper, steel, and all types of sweat fittings.
Dye for Plastics	**Lucidip**	A dye available in a range of twelve colors, which can be used to color acrylic plastic parts after fabrication. Shades ranging from pastel to dark colors can be obtained.	For dyeing plastic parts by immersion.
Molding Compound	**Lucite HM-122**	A methyl-methacrylate molding compound with a heat resistance 30 to 40 degrees F. higher than general-purpose powders. It has faster setting properties and added resistance to breakdown from heat at molding temperatures. Moldings of this compound have unusual clarity and brilliance, as well as excellent reflecting properties.	In war products, it has been used for switchboard light signals, parts for sextants and stethoscopes, blackout lenses for military vehicles, airfield landing light lenses, relay box covers, battery adaptors, and control wheel knobs. Commercial and industrial applications are expected to include tail-light and other colored lenses, covers for running lights of planes and ships, and wherever a transparent plastic protective covering resistant to high temperatures is needed.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Rubber Substitute	**Marvinol**	A vinyl type thermoplastic that has superior abrasion resistance, withstands constant flexing without fatigue, and is impermeable to gases and liquids.	Used to make automobile tire inner tubes and industrial gloves.
Laminated Plastic	**Micarta 444**	A hot-forming laminated plastic with a tensile strength of 13,000 pounds per square inch, a flexural strength of 19,000 pounds per square inch, and a compressive strength of 30,000 pounds per square inch. It does not become brittle at subzero temperatures nor wilt at elevated temperatures.	Both appearance and structural characteristics of this material give promise of many applications.
Stop-off Lacquer	**Miccrome**	A lacquer that can be applied by brushing, dipping, or spraying. It dries rapidly in the air, and can be readily removed by peeling or dissolving.	Specifically developed for the masking of parts for hard chrome plating.
Solvent for Protective Coatings	**Miccrostrip**	A non-toxic solvent that contains no acids and will not affect any metal finish.	Useful for removing lacquer employed to mask parts for hard chromium plating or selective hardening.
Plastic Tubing	**Miccrotube**	This tubing is made from a tough, elastic plastic-base material that has exceptional resistance to plating baths and cleaning solutions. It withstands hot plating solutions, including copper plating solutions at 180 to 190 degrees F., as well as practically all types of boiling cleaning solutions, without deterioration.	Generally used in combination with Miccrotape for the insulation of electroplating racks.
Gage and Die Protective Compound	**Micronoil**	A liquid which, when applied to surfaces or edges of gages for precision measurement, greatly increases their wear resistance and thus helps to maintain accuracy over extended periods.	For treatment of gages, precision dies, taps, punches, and reamers.
Soldering and Tinning Flux	**Mogul**	This flux has a lower melting temperature than soft silver solder on initial heats. When once activated, it will work at temperatures slightly higher than those used for regular 60-40 solder.	Used for the soldering and tinning of a wide range of metals, including cast iron, steel, aluminum, and copper.
Casting Sealer	**Mogul Cast-Seal**	A compound that forms an effective seal when forced into pin-holes or cracks.	For use in salvaging defective castings.
Treatment for Plastic and Rubber Molds	**Moldeze**	Application of this liquid to molds imparts a smoother, more brilliant finish to the molded part. It also inhibits rust, thus protecting the surface of molds when not in service. The liquid does not build up a coating or film on the mold.	For use in preventing adherence of molded material to molds.
Plastic Tubing	**Natvar No. 400**	A plastic tubing superior to the former No. 200 series and having more resistance to elevated temperatures and greater flexibility at extremely low temperatures. It is chemically inert and resistant to acids, alkalies, petroleum hydrocarbons, oil, etc.	In addition to accepted use as an electrical insulation, suitable as protective covering where resistance to solvents, heat, and cold is important.
Annealing Compound	**No. 268**	A dry drawing and annealing compound applied as a waxy, aqueous emulsion. The use of this compound tends to increase die life, reduce the number of operations required, reduce the amount of scrap, and facilitate pickling. While on the workpieces, this compound also prevents corrosion.	For application to brass and steel that has to be deep-drawn.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Rust Inhibitor	**No. 303**	This compound is a water-soluble powder which is normally applied in a pickling or washing machine as a last rinse before drying. The protective coating formed is clean, dry, and practically invisible. It can be removed by a simple water rinse.	For protecting ferrous and ferrous-alloy parts from atmospheric moisture and chemical vapors between machining or drawing operations.
Silver Babbitts	**No. 367** **No. 397**	Two grades of lead-base babbitts containing silver and having physical characteristics comparable to those of tin-base babbitts. They retain hardness at elevated temperatures, are easily bonded, and have high corrosion resistance.	Can be employed as substitute for tin-base babbitts.
Manganese Alloy	**No. 720**	A manganese alloy with a nominal chemical analysis of 60 per cent copper, 20 per cent nickel, and 20 per cent manganese. It is a soft, ductile metal that can be hot- or cold-formed into intricate shapes and then hardened by a comparatively low-temperature aging treatment. Has high tensile and fatigue strengths.	Suitable for springs, diaphragms, and other parts of intricate shape, as well as forgings.
Stop-off Paint	**No-Kase**	A protective coating that can be applied by brushing, spraying, or dipping.	Can be used as a stop-off paint for selective carburizing in a liquid carburizer.
Corrosion Inhibitor	**Nopco 1692**	A rust and corrosion inhibitor that leaves a soft, greasy film on parts after dipping and drying. Wet articles can be treated, since water is displaced by inhibitor.	For protection of metal parts against rust and corrosion.
Latex Insulation	**Nubun**	This synthetic-rubber insulation has high flexibility, impermeability to water and high dielectric strength.	Intended for the insulation of power, lighting, and communication cables.
Plastic	**Nylon**	A thermoplastic with a high softening point of 450 degrees F. It is of light weight, burns slowly, undergoes little or no deterioration with age, and is only slightly affected by sunlight. It resists oil, grease, solvents, alkalies, and weak acids. Can be easily machined.	Two potential applications are bearings and coil springs.
Detergent	**Oakite No. 86**	An acid type, two-function detergent which removes oils and dirt and imparts a microscopic crystalline coating to work surfaces. This coating provides a basis for the firm bonding of a paint or lacquer coat, and resists rusting.	Used as a cleaning, paint and lacquer bonding, and rust preventive compound for steel parts.
Synthetic-Rubber Plasticizer	**Paraplex G-25**	A synthetic resin having high resistance to oils, gasoline, and heat.	Has shown promising results as a plasticizer in polyvinyl chloride cable compounds and cable lacquers, wire enamels, vinyl resin fabric coatings, hot-melt compositions, aircraft gaskets, and sealing compounds.
Metal Finishing Compound	**Pentrate**	A salt mixture that imparts a black oxide film having marked anti-friction and anti-rust qualities.	For application to ferrous metals such as small aircraft-engine parts.
Adhesive	**Plasti-lock 500**	A non-thermoplastic, water-resistant and aromatic oil-resistant adhesive. In metal-to-metal bonding has shown shear strength of 3250 pounds per square inch. Best results obtained when applied under heat and pressure.	Bonding metals, wood, plastics, and ceramic materials. In some instances, can be used in place of rivets or screws.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Synthetic Adhesive	**Pliobond**	A synthetic cement that can be applied for cold-setting or under heat and pressure, depending on the requirements. It belongs to the same family of chemical compounds as synthetic rubbers.	Can be employed for bonding a variety of materials, including metals, plastics, fabrics, vulcanized rubber, paper, leather, glass, plaster, wood, and Portland cement. Using this material, any one of these materials can be bonded to any other.
Sealing Compound	**Presstico**	This compound is produced in three types for flow gun, brush, or spray application. All three types have high resistance to dilute acids, alkalies, and mineral oils.	This compound was developed for sealing spot-welded joints.
Plastic Packaging Materials	**Prox-Peel**	Two groups of plastic materials used to form a closely adhering protective envelope or film. One group includes a number of molten types applied by hot dipping. The other includes several lacquer types which form a film by solvent evaporation. Both types of films provide resistance to moisture vapor, water, and brine.	The lacquer group was developed for application to large pieces that cannot be readily dipped. Both groups are suitable for use on any type of surface, and are easily removed by stripping.
Aluminum Alloy	**R-301**	A composite alloy consisting of a high-strength aluminum alloy core, clad on each face with a corrosion-resistant aluminum alloy of intermediate strength.	Developed to provide a high-strength aluminum sheet and plate with corrosion-resistant surface.
Motor Balancing Compound	**R-943**	A paste or soft putty compound applied easily with the hands or a knife.	Used for balancing electrical motor armatures.
Protective Coating	**Riso**	A soluble oil applied either to metals in process of manufacture or as a final dip for blackened steels.	Used as a corrosion-resistant agent for all metals.
Rust Preventive Compound	**Ru-Pre-Sol**	A rust preventive compound that dries on the surface of the work to form a tight but invisible protective film.	Used as an addition to water-soluble cutting oils.
Rust Preventive	**Rust Veto 110A**	An amber-colored liquid, applied by brush or spray, that dries to a hard, transparent coating, flexible at temperatures ranging down to —70 degrees F. When dry, the coating is non-inflammable. It adheres firmly to metal even after 24-hour water immersion.	Used to protect various metal surfaces against oxidation.
Synthetic Rubber	**Silastic**	A family of elastic silicone products characterized by exceptional heat resistance. They remain elastic at temperatures ranging up to 500 degrees F. and retain flexibility at temperatures as low as —70 degrees F. Silastic coatings are resistant to oil and salt brines at elevated temperatures, and adhere to glass, vitreous enamel, iron, steel, and aluminum.	Used alone and in conjunction with glass or asbestos to produce flexible, waterproof, heat-stable, oil-resistant gaskets, diaphragms, tape, and electrical insulation.
Cutting Lubricant for Glass	**Sinszine**	A lubricant that aids in rapid, smooth drilling and promotes longer tool life.	For drilling glass.
Ladle Inoculation Alloys	**SM SMZ**	SM ferrochrome alloy supplies chromium additions to iron or steel in the ladle. SMZ alloy contains silicon, manganese, zirconium, and iron. It provides an economical and efficient means of obtaining a strong machinable gray iron from a low-silicon white iron, or an improved gray cast iron by a ladle addition.	Used as a ladle inoculation for the improvement of cast iron and the addition of chromium to iron or steel.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Insulating Varnishes	**Speedairbonds**	A group of air-drying insulating varnishes that quickly dry to a smooth glossy finish. They are oil-proof and extremely water-, acid-, and alkali-resistant, and have high dielectric qualities, flexibility, and long life.	For use in the manufacture and repair of electrical equipment.
Floor Cleaners	**Speedi-Dri** **Sol-Speedi-Dri**	These two floor cleaning products quickly absorb grease and oil from any kind of floor and provide anti-skid protection. Repeated spreading tends to return floor to its original color.	Applied to floors to prevent slipping accidents and fires caused by oil-soaked conditions. Speedi-Dri is intended for use on mineral-oil soaked floors. Sol-Speedi-Dri is used to soak up soluble oils, oil and water accumulations, paints, resins, etc.
Cleaning Compound	**Steam-Off**	This compound combines a high degree of quick cleaning action with the ability to soften the water, and rinses freely, leaving no film, curds, water spots, or streaks. It functions without loss of cleaning power in the hardest water, and prevents the depositing of hard-water scale in the steam cleaning machinery.	For use in the removal by steam cleaning of the heaviest and most stubborn grease and dirt from iron and steel surfaces, concrete, brick, and structural materials, gasoline and Diesel engines, steam shovels, tractors, locomotives, and road-building machinery.
Hardening Solution	**Steel-Temp**	A hardening solution for tool steel that gives improved results over ordinary quenching methods, while at the same time imparting toughness. Makes additional tempering operations unnecessary.	Can be used in the hardening of water- or oil-quenching steels.
Protective Coating	**Stripcoat**	Metal parts dipped in Stripcoat are coated with a tough skin-tight protective layer, which conforms to the identical contours of the part and remains tough and durable throughout a wide range of temperatures. The molten material sets quickly without the aid of mechanical drying equipment.	This coating was developed to protect and package metal parts in one operation.
Floor Material	**Stonoleum**	This floor material is self-bonding and can be laid over old concrete, cement, wood, or composition floors without adhesives or separate bonding agents. The material is said to feel like rubber, but wears like stone.	As an industrial floor covering.
Polystyrene Plastic	**Styron 411**	An improved polystyrene plastic to replace Styron K-27. This plastic has increased weld strength, better machinability, and is buffed more easily. Surface marks are reduced, enhancing the appearance and adding brilliance and gloss. Welds are scarcely perceptible.	For applications similar to those of other polystyrene plastics.
Brazing and Silver Soldering Flux	**Superior No. 6**	An alkaline, non-corrosive, non-fuming flux which contains no free fluorides and does not spatter, pit, or stain the metal around soldered or brazed joint. Has effective temperature range of 850 to 1650 degree F., and tends to draw solder through small clearances and long tubular joints.	For use with any brazing alloys of low melting point or with silver solders for joining both ferrous and non-ferrous metals and alloys.
Metal Cleaner	**Swirt**	This compound is neither acid nor alkaline, and will not etch or pit ferrous or non-ferrous metals and alloys. It has a flash point of 155 degrees F. open cup. It gives off no dangerous or disagreeable odors.	For use in removing all types of soil, including grease, buffing compounds, cutting and machining coolants, and oils.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Thermosetting Resins	**Thalid X500**	A group of completely reactive thermosetting resins used for impregnating fabric or paper to form a light, hard, rigid, durable product after baking. The composition of the resin can be adjusted to provide a very rapid curing after the center of the laminate reaches curing temperature.	For use in making impression moldings from molds made of wood, sheet metal, plaster, or concrete.
Deep-drawing Alloy Steel	**Ti-Namel**	Enamel applied to this deep-drawing alloy steel does not blister or become marked by black specks or fish-scale. This steel has excellent drawing properties, and does not age-strain, so that neither special temper rolling nor roller leveling to prevent strain lines is required. Shallow panels of large areas remain flat and true to required shape and form after drawing operations.	Specifically designed for direct application of vitreous enamel without base or ground coat. Can be used for drawing many parts heretofore formed and welded.
Protective Coating	**Triad PR**	Applied with brush or a spray gun, it forms a hard, white, dustless covering that can be easily stripped off after spraying with water or steam.	As a protective coating for the side walls of spray booths.
Heat-resisting Paint	**Triple-A**	A high heat-resisting paint. When conditioned by heating after application, it will resist water, oil, gasoline, benzol, heat, and weather. Will adhere to light steel under rapid heating and cooling when subjected to temperatures up to 14,000 degrees F. On alloy steel, brick, etc., will withstand temperatures up to 2500 degrees F. It is non-inflammable and does not give off odors when heated.	For use on interior and exterior surfaces subjected to high temperatures.
Sanitation Material	**Tri-San**	This is a mild, alkaline, free-flowing powder, completely soluble in water, forming a clear colorless, odorless solution. In dilutions recommended for various sanitary tasks, it is practically non-toxic. It deodorizes, cleans, and disinfects surfaces in one operation.	Suitable for use in wash-rooms, locker-rooms, first-aid rooms, cafeterias, etc.
Pickling Agent	**Troxide**	A dry, inert compound that is non-eruptive and non-inflammable. It gives off no "acid mist" or other toxic fumes that are pungent, corrosive, and harmful to workmen and machinery.	Suitable for removing rust, scale, tarnish, and incrustations of cement and lime from metals.
Mold Spray	**Truline Mold Spray 91**	This spray is made from a special resin dissolved in a quick-burning solvent. It strengthens, hardens, and dries the mold surface in one application. Tends to guard against burned-out binders and green spots in the mold.	Is applicable to molds used in the production of steel, iron, and non-ferrous castings.
Compound for Treating Galvanized Surfaces	**Turco Redi-Paint**	A compound that roughens galvanized surfaces, neutralizes any surface alkalinity, makes the metal passive, and forms a corrosion-resistant film.	For preparing galvanized metal surfaces so that paint will adhere to them permanently, without chipping or peeling.
Synthetic Rubber	**Uskol**	A sixth major type of synthetic rubber having a high degree of solvent resistance.	Intended for use in the manufacture of products that come in contact with fuels, oils, gasoline, dry cleaning fluids, and chemicals harmful to natural rubber. Used on paper and cardboard, it renders them resistant to grease, water, and chemicals.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Plastic Resins	**Vibron**	A line of liquid plastics which, when combined with spun glass or other fabrics, form materials that are said to have a strength per pound equivalent to that of steel. Expensive and cumbersome high-pressure equipment is not needed for manufacturer of products made of these materials.	Use of these plastics will provide stronger building materials for prefabricated housing.
Aluminum Surface Cleaner	**Vulco-etch**	A method of rendering aluminum surfaces chemically and metallurgically clean by means of a chemical bath which frees surface of oxides, corrosive salts, and tenacious grease and oil films.	For preparing aluminum surfaces for spot-welding.
Plastic Board	**Walesite**	A uniformly dense, strong, light-weight laminated lignin plastic board which is resistant to water, oil, grease, and dilute acids. It can be sawed, turned, drilled, tapped, threaded, and milled with metal-working tools.	Used for making punch-press plate seats and for mounting hole-punching and notching units in presses.
Rust Inhibitor	**Witco No. 673**	When applied by either dipping or spraying, it forms a rapid drying coating that is non-abrasive, non-corrosive, and is easily removed with ordinary solvents.	For protecting metal parts and equipment during storage, shipment, and in some cases, during service.
Resin Glue	**XC-17613**	A cold-setting, phenolic, resorcinal resin glue, that provides maximum water resistance and durability for outdoor wood-bonding applications.	For use in bonding exterior plywood, laminated lumber, beams, trusses, and ships' keels. Also recommended for aircraft and marine assembly work.

Results Obtained with the Lincoln Incentive System

IN a letter addressed to President Truman by James F. Lincoln, president of the Lincoln Electric Co., Cleveland, Ohio, on the subject of the labor-management conference called by the President with a view "to avoid industrial strife in the post-war era," Mr. Lincoln directs attention to the following results that have been obtained by the incentive system used over a long period of years in the Lincoln plant:

1. No strife. Not a single hour has ever been lost through misunderstanding between worker and management.
2. Continuous employment. No person in the last twenty years has been laid off because of lack of work.
3. Steady income. No reduction in wage rates made in that period.
4. More jobs. The number of people employed has been increased by more than four times.
5. Wider markets through lower costs. It has been possible to reduce selling price by more than 60 per cent (while all other manufactured products have been increased by an average of 25 per cent), resulting in wider distribution, both domestic and foreign.
6. More pay. The earnings per man have been increased more than four times, which is double that of industry in general.
7. Financial stability. The dividends to the shareholders (practically all of whom are workers) have been continuous and increasing.

At the end of his letter Mr. Lincoln says: "Such a plan should be adopted throughout all industry. Collective bargaining has failed to answer the problem—it only promotes civil war in industry. Cooperation has succeeded and will succeed."

* * *

Course in Industrial Vision

Purdue University, Lafayette, Ind., has created an Industrial Vision Institute, where a two and one-half weeks' intensive course on the installation and administration of "vision" programs in industrial plants are being given. Further information relating to this course can be obtained by addressing the Industrial Vision Institute, Biology Annex, Purdue University, West Lafayette, Ind.

Editorial Comment

In these days when so much is being said and written about the duty of industry to provide full employment after the war, it is well to give a thought to who it is that actually provides employment for workers. Most people seem to think that it is industry—the industrial manager—that provides employment. Furthermore, they seem to think that it is a matter of his own choice whether he provides this employment or not. Nothing could be more shortsighted. The industrial manager is merely the intermediary between the real employer and the worker. Who, then, is the real employer?

Odd as it may seem, it is largely the worker himself. The real employer is the buying public, including the men and women who work in industry, producing the goods that they themselves require for comfort and well-being in their daily life. It is the men and women who work in American industry and on American farms—whether with their hands or their brains—who provide jobs for themselves by buying the products of industry and farm. Unless somebody buys the products of a manufacturer, he cannot provide employment.

The Real Employer is the Purchaser of the Product

To be sure, some men, through their initiative and enterprise and their courage to invest and venture, create opportunities for employment, while others fill the jobs thus created. The enterprising men also are the ones who create a demand for the product of the workers by advertising and by devising selling and distribution methods; nevertheless, no one can create jobs unless he also can find customers, because the customer is the real employer.

Suppose a man works in a machine tool plant or in a shop making tools and equipment for machine shop use. Every time he buys an automobile, or a washing machine or vacuum cleaner for his wife, he is helping to provide a job for himself; because it is the plants that make automobiles, washing machines, and vacuum cleaners, and the hundreds of other products that the worker buys and uses, that, in turn, buy and use the machine tools and the accessories that he helps to make. Hence, the machinist or toolmaker is actually to that extent his own employer—as a consumer he helps to provide a job for himself.

The Worker Helps to Provide a Job for Himself

In the days of peace to come, the more useful goods, of permanent value, that we are able to buy, the more certain we are of continued prosperity of industry and of steady jobs for all who are able and willing to work.

During the war, American manufacturers, engineers, and skilled workers have become more precision-conscious than ever before. Equipment and products made directly or indirectly for the prosecution of the war have been manufactured to limits of accuracy never before heard of in commercial work. And those engaged in the manufacturing industries will continue to be more precision-conscious than they were five years ago. This will prove highly advantageous in some directions, but it may also have its disadvantages. There is always the danger that the precision-conscious man will insist on precision, even in cases where it is not actually required.

It is Possible to Carry Precision to Extremes

This happened after the last war. While the degree of precision then attained is not comparable with what has been accomplished in the last few years, it was nevertheless far greater than that commonly accepted as practicable before that war. In the early twenties, a degree of precision was often requested by buyers of machinery, tools, and gages that was wholly unnecessary for the purpose for which the products were to be used.

There is a danger that the same may happen now, when we return to civilian production, and that limits of accuracy will be specified by some engineers and designers that are far beyond the practical needs. Precision just for the sake of precision is wasteful; and since waste should be repugnant to every engineer, he should be careful not to encourage it when the object to be attained does not require extreme accuracy. Judgment as to when and when not to demand close tolerances is a rare quality, but it is the mark of a competent designer and engineer.

Ingenious Mechanical Movements

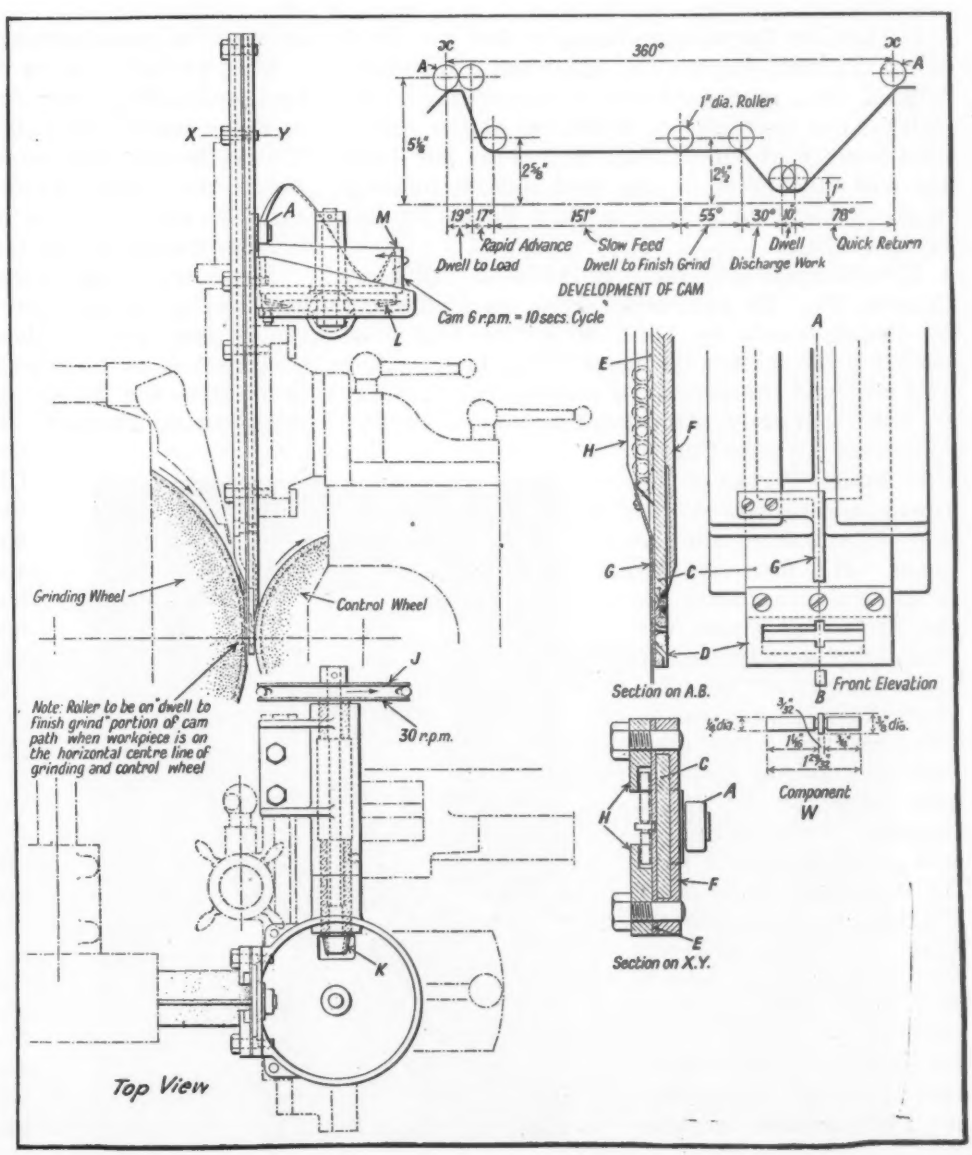
Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Automatic Magazine-Feed Attachment for Centerless Grinder

The automatic magazine-feed attachment shown in the accompanying illustration was designed for grinding the part or component shown in the detail view at *W*. This part, because of the shoulder, must be fed downward in the correct endwise position for the shoulders to pass into the clearance groove provided in both wheels. To accomplish this, a mechanical attachment is necessary. The illustration shows the attachment in position on the grinding machine, mounted on the side of the wheel-truing device. It can be easily adjusted to suit the position of the grinding and control wheels, both longitudinally and crosswise. The vertical position is permanent, and needs no further adjustment after the initial setting.

The section on the center line *A–B* shows an enlarged partial view of the sliding member *C*, the work-carrier *D*, which is made of hardened steel; the spacer plates *E*; the sliding member guide *F*; the spring finger *G*, which keeps the work-piece from falling forward when approaching the grinding wheel; and the strips *H*, which form the magazine into which the work-pieces are loaded.

The section *X–Y* shows an enlarged plan view of the magazine and its component parts. A piece to be ground is shown by dot-and-dash lines in the feeding position. The enlarged partial view of the front elevation (section *A–B*) shows the hardened-steel work-holder or carrier *D* which is attached to the sliding member *C* and the slot where the work-piece is retained and guided. Also shown is the position of the



Details of Automatic Magazine Feed Designed for Centerless Grinder

spring finger *G* in relation to the work-holder. The action of the whole mechanism is more readily understood if the cam development diagram at the top of the illustration is carefully inspected. This diagram shows clearly all positions of the sliding member *C*. It is necessary that the weight of the sliding member be sufficient to keep roller *A* in contact with the face of cam *M*.

Pulley *J* is driven by a belt running from the control-wheel shaft. The bevel pinion *K* is integral with the pulley shaft and engages bevel gear ring *L* attached to the under side of cam *M*, thus causing it to rotate in the direction and at the speed indicated.

The operator drops the work into the magazine at the open end; and when the sliding member *C* is in the top position, the slot in the work-holder *D* coincides with the curved angular path at the bottom end of the magazine strip *H*. The piece at the bottom of the magazine then rolls forward into holder *D*, which is carried downward on the rapid advance portion of the stroke actuated by cam *M* until it reaches the grinding position, where it is finished to size in the predetermined time period indicated on the cam lay-out.

Proceeding from the "dwell to finish-grind" portion on cam *M*, the sliding member *C* passes to the lowest position in its travel. During this period, the work is carried clear of the grinding and control wheels, and is free to drop out at the control wheel side of the work-holder into a receiving box. Sliding member *C* is now returned to the highest point of the cam path, which completes the time cycle per piece.

D. Robert Yarnall—A.S.M.E. President for 1946

D. Robert Yarnall, co-founder and president of the Yarnall-Waring Co., Chestnut Hill, Philadelphia, Pa., manufacturer of power-plant specialties, has been elected president of the American Society of Mechanical Engineers for 1946. He will take office at the next annual meeting of the Society, to be held in New York City late in November.

Mr. Yarnall was born in 1878 in Delaware County, Pa. He graduated from the University of Pennsylvania in 1901 with the degree of bachelor of science in mechanical engineering and received the degree of mechanical engineer in 1905. Shortly after graduation, he became connected with the Coatesville Boiler Works as engineer, and remained with that organization for five years. He next worked in a similar capacity for the Stokes & Smith Co., Philadelphia, where he also remained for five years. In 1912, he became vice-president and general manager of the Nelson Valve Co., of Philadelphia, with whom he was associated until 1918. At that time, with B. G. Waring, he organized the firm of Yarnall-Waring Co., and has been identified with that company ever since. He is also a director and president of the James G. Biddle Co., a Philadelphia concern engaged in manufacturing electrical instruments.

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Mr. Yarnall's work in design and construction, extending over forty years, has resulted in many patents on valves and steam specialties. These devices are now in use on practically every Government-controlled steam-operated ship, as well as in all high-pressure steam-generating plants in the United States.

Mr. Yarnall has been exceptionally active in engineering society work. He has been a director and vice-president of the Engineering Foundation, and a director and chairman of the Committee on Public Affairs of the American Engineering Council. He has served as president of the Engineers Club of Philadelphia and been a trustee of the Franklin Institute. He was manager of the American Society of Mechanical Engineers from 1917 to 1920, and was president of the United Engineering Trustees—a joint agency for the four founder societies of civil, mining, mechanical, and electrical engineers. He is the author of many technical papers published in *Mechanical Engineering* and in the *A.S.M.E. Transactions*. In 1941, he was awarded the Hoover Medal by the A.S.M.E., and in the following year he was made doctor of engineering by Lehigh.

Engineering News

Instrument for Accurately Measuring Gas or Liquid Pressure

Utilizing the principle that the electrical characteristics of a wire filament change with physical strain, the Southwark Division of the Baldwin Locomotive Works, Philadelphia, Pa., has developed a device that promises to find wide application. The new instrument, called the SR-4 pressure sensitive device, converts gas or liquid pressure into electrical energy for measuring, recording, or controlling. Accuracy to within one-fourth of 1 per cent has been consistently obtained. The device is available in several ranges up to 20,000 pounds pressure per square inch. It is based on the principle of the SR-4 strain gage, which, in the five years since its introduction, has proved to be a most efficient instrument for obtaining accurate information on the strains and stresses of materials and structures under actual load conditions.

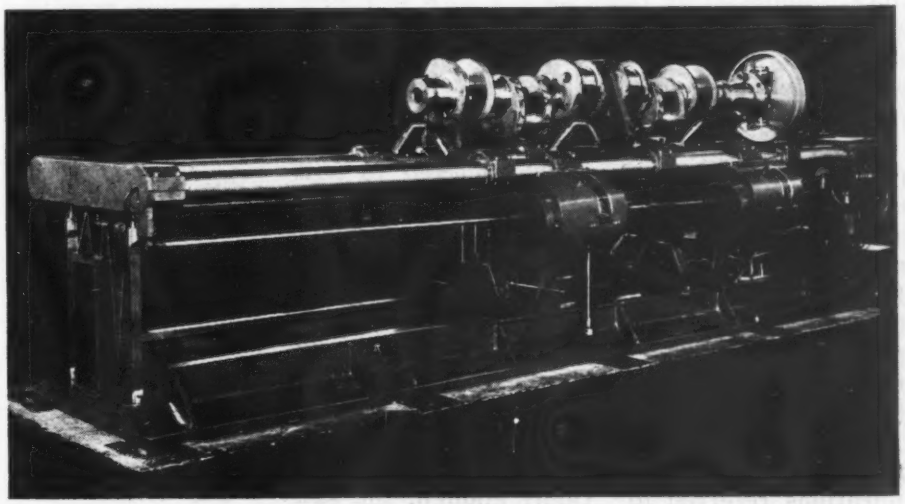
The heart of the device is a very fine filament wire bonded to a hollow metal core against which is exerted the gas or liquid pressure to be measured. As the pressure increases, this filament stretches, thus changing the diameter of the wire and causing measurable changes in the electrical resistance of the wire. The change in resistance varies the amount of current flowing through the filament circuit, and when amplified, these changes show up on a dial or are used to actuate a control system. The filament is sensitive to a "stretch" of the metal core of one-millionth of an inch. The device is approximately 1 inch in diameter and 5 1/2 inches in length. It is hermetically sealed.

World's Largest Troop-Carrier Land-Based Airplane

What is said to be the world's largest troop-carrier land-based airplane is being constructed by the Consolidated Vultee Aircraft Corporation. It is the military counterpart of the 200-passenger luxury airliner ordered by the Pan American World Airways for post-war trans-oceanic service. The troop-carrier plane has a wing span of 230 feet, a length of 183 feet, and is equipped with six engines. The new plane may also be used as a heavy cargo or hospital plane, and will be readily convertible for either service. As a cargo plane, it will carry a payload of 50 tons over a distance of 1500 miles. When it is loaded with 19,000 gallons of fuel, it will have a range, with reduced payload, of approximately 8000 miles.

Cemented-Carbide Tipped Drills Facilitate Dentists' Work

The higher speed and freer cutting made possible with dental drills tipped with Carboloy cemented carbide are said to reduce the time the patient must spend in the dentist chair and to actually eliminate some of the pain attendant in this connection. It is said that one Carboloy Company executive takes along his own quick-boring Carboloy tipped drills when he visits his dentist, taking no chances on the dentist not being equipped with these ultra-modern dental burrs of hard carbide metal.



A Huge Balancing Machine Built by the Tinius Olsen Testing Machine Co., Philadelphia, Pa., and Installed at the Cooper-Bessemer Corporation's Plant, Grove City, Pa. This Machine is Built to Handle Diesel-engine Crankshafts with Bearings up to 9 Inches in Diameter and Weighing as Much as 5800 Pounds. These Crankshafts are almost 16 Feet in Length

Friction Cutting of Metals by Band Saws

By H. J. CHAMBERLAND, Springfield, Mass.

THE cutting of metal by "friction saws" is not a new method, but the application to band saws has increased considerably in recent years. The introduction of very high velocities in band-saw operation has played an important part in making this method more generally accepted.

For cutting metals by friction in a band saw, the same type of saw band is used as is employed for ordinary metal band sawing. The saws are specially heat-treated to stand up under the high heat developed at the high cutting speeds. It must be remembered, however, that the band saw is cooled by the air most of the time, since it is in contact with the metal for only a moment while each section or part of the saw passes through the work being cut.

Briefly, in friction sawing, the heat generated at the point where the metal is being cut is so intense that the material in contact with the saw is softened to a plastic state and hence is more readily cut by the saw than cold, hard metal would be. The band saw is moving past the work at speeds of 3000 to 10,000 feet per minute. As the thickness of the material increases, the saw velocity is increased because, obviously, a greater amount of heat is required to soften the larger area of contact between the saw and work.

At present, all the S A E steels and some other steels and cast irons are cut efficiently by this method. The production rates range from 24 to 60 linear inches on material 1/4 inch thick, to from 6 to 20 linear inches on material 1/2 inch thick. Material as thick as 3/4 inch has been cut successfully; but when the material is thicker than that, certain difficulties have been met with, which it is hoped, will be overcome through research and experiments.

Generally, from 1/2- to 1-inch blades are recommended, with the pitch selected to suit the thickness of the material. In cutting 1/16- or 1/8-inch thicknesses, 18-pitch saws are about right; for from 1/8- to 1/4-inch thick metal, 14-pitch saws are used; and for thicknesses from 1/4 to 1/2 inch, 10-pitch saws. The accompanying table gives the band-saw velocity, in feet per minute, recommended for different types of steel and cast iron.

The saw life cannot yet be definitely estimated, but is considered satisfactory in the applications referred to. Oddly enough, the saw reaches its peak of efficiency only after one-half hour of cutting; from then on it will cut well until the teeth have worn down to about 75 per cent of their original size. Considering the low cost of blades and the increase obtainable in production through friction sawing, it is economical to take full advantage of the cutting capacity of the saw.

When it is considered that, in ordinary cutting of high-chromium or high-carbon steels, the advance is only about 3/4 linear inch per minute in 1/2-inch thick material, it is to be expected that friction sawing by the band-saw method will receive much attention in the future. The friction method of cutting can also be applied in band saws for cutting curves or irregular shapes.

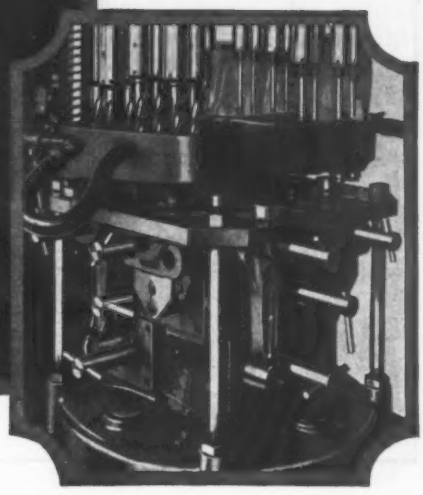
* * *

To foment industrial unrest, encourage strikes, and force the shutdown of plants at a time when the country is trying to get onto its feet after the war exhibits a deplorable lack of concern for the national welfare.

Friction Cutting with High-Velocity Band Saws
Based on Laboratory and Field Tests Made by the DoAll Co.

Material	Saw Velocity, in Feet per Minute		
	Thickness of Metal Cut, in Inches		
	1/16 to 1/8	1/8 to 1/4	1/4 to 1/2
S.A.E. Steels:			
Carbon 1010-1350 ...	3000	5000	7000
Manganese T1330-1350	3000	5000	7000
Free-machining X1112-X1340	3000	5000	7000
Nickel 2015-2515	3000	6000	9000
Nickel Chromium 3115-3415	3000	6000	9000
Molybdenum 4023-4820	3000	6000	9000
Chromium 5120-5150.	3000	6000	9000
Chromium 51210-52100	3000	6000	9000
Chromium Vanadium 6115-6195	4000	7000	10,000
Tungsten 7260-71360..	4000	7000	10,000
Silicon Manganese 9255-9260	4000	7000	10,000
N E Steels 8024-8949..	4000	7000	10,000
Other Steels:			
Armor Plate	3000	5000	9000
Stainless 18-8	3000	5000	9000
Illium	4000	7000	10,000
Cast	3000	5000	9000
Cast Irons:			
Gray	3000	5000	7000
Malleable	3000	5000	7000
Meehanite	3000	5000	7000

Design of Tools and Fixtures



Automatic Hopper-Fed Knurling Fixture

By ALEX S. ARNOTT, Toronto, Ontario, Canada

The straight type knurling on the part shown at *A*, Fig. 1, was originally produced in a lathe, using a knurling tool held in the toolpost. Although this method gave good results and is probably the one most commonly employed for knurling on a production basis, it was found desirable to devise some means for increasing production.

This was accomplished by designing the automatic hopper-equipped knurling fixture shown in the illustration, which was mounted on a milling machine table, the parts *A* to be knurled being loaded into the hopper *B*. From hopper *B* the parts are fed into the fixture automatically and held at *C* for knurling with the tool *K* mounted on the milling machine spindle, after which they are unloaded into a receptacle. The entire knurling operation, except for loading the work into the hopper, is performed automatically.

The milling machine table to which the fixture is secured is adjusted to permit the work to be properly presented to the knurling tool *K*. The cams that actuate the fixture are driven by a 1/3-H.P. electric motor, which is also mounted on the milling machine table. The motor, operating at a speed of 1425 R.P.M., drives the worm-shaft *U* at a speed of 700 R.P.M. through

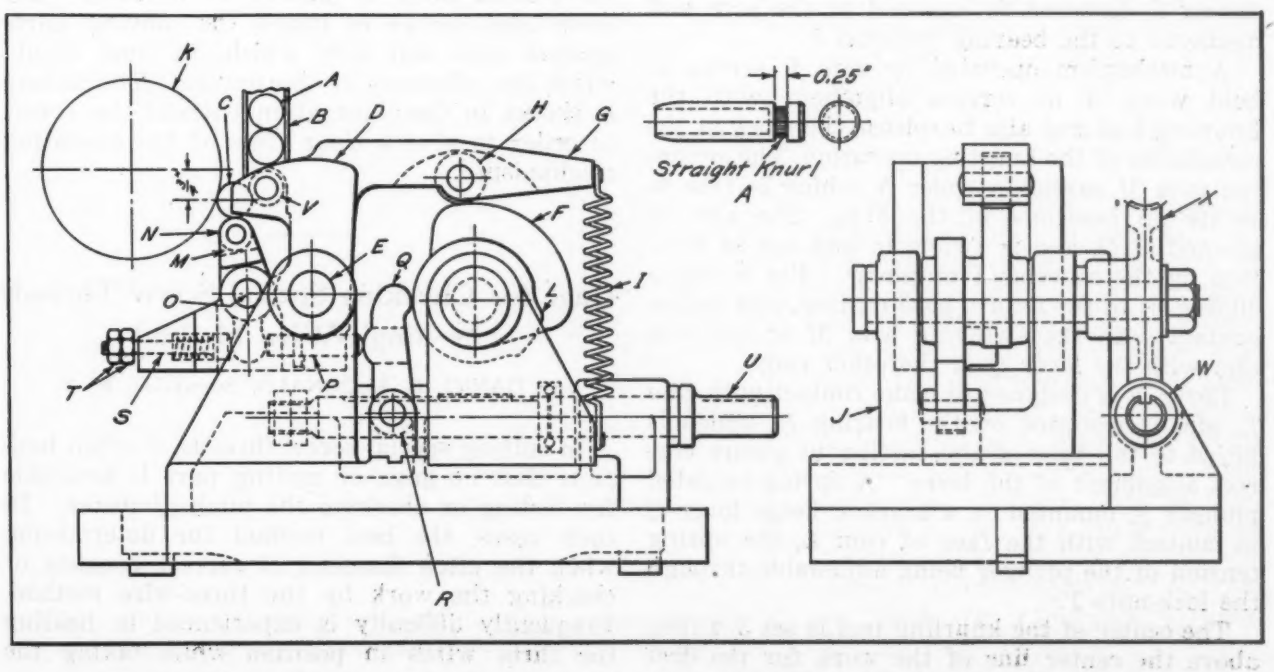


Fig. 1. Fixture with Automatic Hopper Feed for Producing Straight Knurl on Piece Shown at A

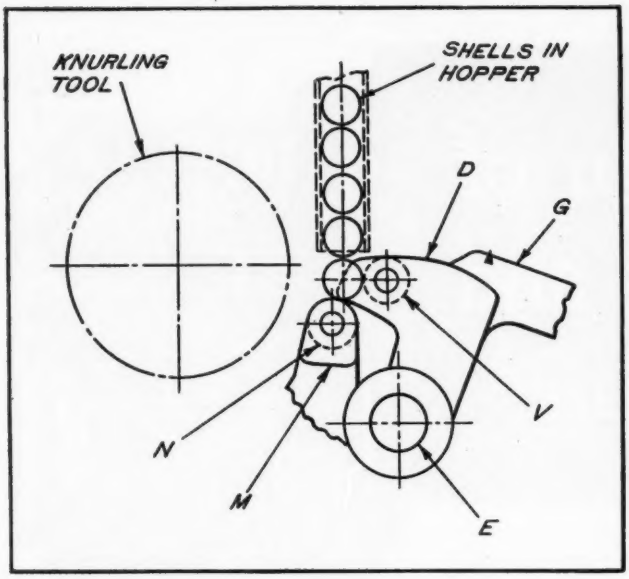


Fig. 2. Diagram Showing How Parts to be Knurled are Fed from Hopper to Knurling Position

a V-pulley (not shown). A worm *W* on shaft *U* drives a worm-wheel *X* on the shaft on which cams *F* and *L* are mounted.

The hopper *B* is made from sheet metal to the correct dimensions for accommodating the work. As parts *A* are fed down through the hopper by gravity, hopper arm *D* prevents them from passing the knurling position. This arm is mounted on the shaft *E*, and swings into the position shown in Fig. 2 when actuated by the rotation of the cam *F*, Fig. 1, acting through the extended arm *G* and roller *H*.

Roller *H* is inserted in a milled slot in arm *G*, where it is held by a dowel-pin, which leaves it free to rotate. The face of the roller is held in contact with the face of cam *F* by the tension spring *I*, fastened to one end of the arm and anchored to the bearing pedestal *J*.

A mechanism operated by cam *L* serves to hold work *A* in correct alignment with the knurling tool and also to release the work at the completion of the knurling operation. The swinging arm *M* carries a roller *N* which is free to rotate on bearings in the arm. The arm is pivoted at *O*, and is swung in and out of position by the movement of pin *P*. Pin *P* has a sliding fit in the fixture base casting, and makes contact with the swinging arm *M* at one end and with the lever *Q* at the other end.

Lever *Q* is designed to make contact with cam *L*, and is mounted on the bearing *R*, which is keyed to the base of the casting to assure correct alignment of the lever. A spring-actuated plunger *S*, mounted on a bracket, keeps lever *Q* in contact with the face of cam *L*, the spring tension of the plunger being adjustable through the lock-nuts *T*.

The center of the knurling tool is set 3/4 inch above the center line of the work for the first operation. When the motor is started, shaft *U* rotates the worm and worm-wheel, which, in turn, rotates cams *F* and *L*. The rotation of the cam *F* allows the extended arm *G* to drop to the lower position, as shown in Fig. 2, permitting one part *A* to drop down on the roller *V* on the extended arm *G* until it finally rests on the two rollers *N* and *V*. At this point, cam *F* moves the hopper arm *D* into the position shown in Fig. 1, which pushes the work toward the knurling tool *K*.

When the part makes contact with the knurling tool, the dwell portion of cam *F* serves to hold lever *G* in the correct position for completion of the knurling operation. At the same time, the roller *N* on the swinging arm *M* allows the work to rotate with the knurling tool *K* until the whole circumference of the part has been knurled.

At this point, cam *L* is brought into action, pushing the lever *Q* forward against the pin *P*, which, in turn, forces the arm *M* to swing into the position shown in Fig. 2. As the arm swings into the open position, the finished product is released from the fixture and is dropped down in a forward position into the receptacle. Cam *F* is then in a position to allow another part to drop down while the cam *L* is moving forward to meet the new part and support it during the knurling operation.

The tension spring *I* keeps the extended arm in contact with the cam *F*, and the spring on plunger *S* applies pressure through arm *M* to lever *Q* to assure contact with cam *L*. The hopper is filled with work by the operator while the fixture automatically performs the knurling operation and removes the finished parts as they are completed.

The fixture is completely enclosed with a sheet-metal cover to protect the operator. The cover also serves to guard the moving parts against dust and dirt, which, in time, would affect the efficiency of the fixture. The fixture is shown in the illustration without the cover, in order to give a clear view of the operating mechanism.

Gage for Checking Special Screw Threads by Single-Wire Method

By DANIEL E. McDONALD, Sunnyside, N. Y.

In cutting special screw threads, it often happens that no gage or mating part is available for testing or checking the pitch diameter. In such cases, the best method for determining when the pitch diameter is correct consists of checking the work by the three-wire method. Frequently difficulty is experienced in holding the three wires in position while taking the

measurement with a micrometer. This procedure also consumes considerable time.

With the special device shown in Figs. 1 and 2, the pitch diameter of screw threads can be easily checked by using only one wire. Although this device was originally constructed for the purpose outlined, it has also been found useful in the tool-crib for checking plug gages before they are sent out to the shop or tool-room.

Fig. 2. Using Single Wire and Special Micrometer with V-slot to Determine Pitch Diameter of Screw Thread

Referring to Fig. 1, the standard micrometer head *A* is fitted to a special V-block *B*. In use, as shown in the view to the left, Fig. 1, the vee in block *B* is brought into contact with the major diameter of the thread. The micrometer spindle at *C* is adjusted until the desired "feel" or contact with the work is obtained, and the micrometer reading noted. The micrometer spindle is then withdrawn, and the proper size thread-measuring wire *D* is inserted through the slot in the side of V-block *B*, as shown in the view to the right, Fig. 1, and in Fig. 2. The micrometer is now adjusted again until the proper contact is obtained between the spindle and the top of the wire. The difference between this reading and the first, which represents distance *E*, will indicate whether or not the pitch diameter of the thread is correct.

As an example, assume that a thread 2 inches in diameter, having eight threads per inch, is to be checked. The proper wire for checking the eight-pitch thread is 0.07217 inch in diameter. When this size wire is used in taking a reading by the three-wire method, the total reading obtained over the wires would be 0.027 inch greater than the major diameter of an eight-pitch thread. Therefore, when only one wire is used, as shown in the illustrations, the difference in reading, assuming that the pitch diameter is correct, will be one-half of 0.027 inch, or 0.0135 inch.

It is understood, of course, that the outside diameter is known to be correct before taking the measurements with this device. Under these conditions, the original reading obtained can be used for all succeeding pieces of the same major diameter. The measuring device can also be used to advantage in checking diameters when certain types of grinding work are being performed. If desired, a set of gage rolls can be provided for which the micrometer readings for various given diameters can be determined.

The general construction of the V-block *B* is shown in Fig. 1. The angle of the vee is 45 degrees on each side, forming an included angle of 90 degrees. The top of the V-block is bored to provide a firm press fit between the micrometer body and the block. The block *B* should be made from a good grade of tool steel. It should be hardened, and the vee surfaces should be ground.

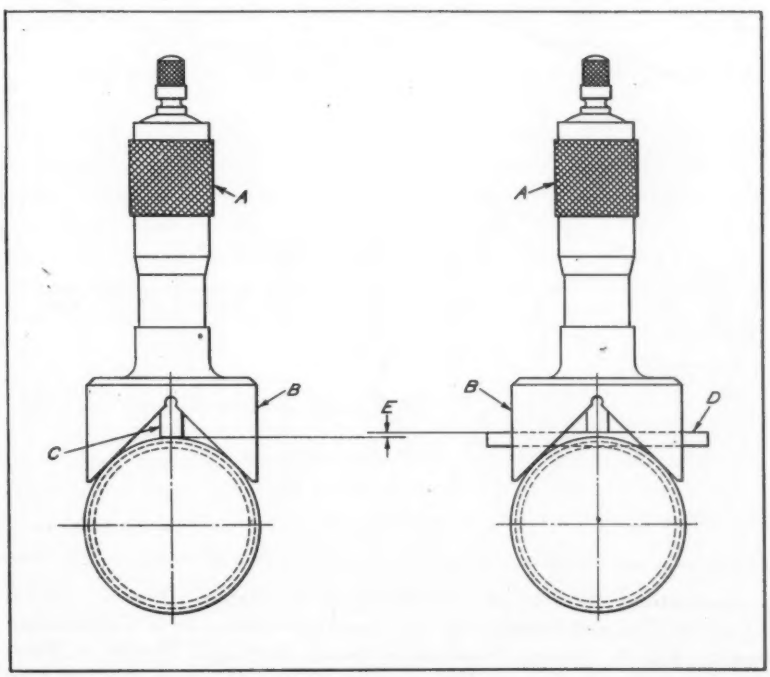


Fig. 1. Diagrams Showing Methods of Taking Measurements with Special Micrometer to Determine Pitch Diameter of Thread

* * *

"We cannot meet the challenge for peacetime employment by adopting panaceas. We tried all that in the '30's. It did not work and it never will work. Instead, we have to do those things that stimulate enterprise and that build confidence. Men cannot plan ahead unless they have confidence in the future. They cannot plan if their confidence or their faith is lacking or if they are hamstrung by national policies that prevent the expansion of enterprise."—*Alfred P. Sloan, Jr., Chairman, General Motors Corporation*

Improved Method of Brazing Carbide Tips to Shanks

By WILLIAM E. NEWCOMER, Newcomer Products, Latrobe, Pa.

PRIOR to the war, carbide tools were seldom used for cuts deeper than 3/4 inch because of the high percentage of cracked tools that resulted when deeper cuts were attempted. If more stock had to be removed, two or more cuts were taken. When the war started, time became an important factor, and it was deemed inadvisable to take two cuts in place of one. Armament manufacturers began to accept broken tools as one of the necessary evils of high-speed production, especially in the machining of rough forgings.

To reduce the hazard of broken tools, it is important to eliminate as far as possible the strain set up when the carbide tip is brazed to the steel shank. This strain has the effect of reducing the tensile strength of the tip, since it exerts a downward bending force on the cutting edge of the tool in the same direction as the normal cutting load. The brazing strain is caused by the uneven contraction of the steel shank and the tip after the brazing material has solidified. Fig. 1 indicates that this is the resultant strain (vertical arrow) of the basic strains (horizontal arrows), and is comparable to the bimetal thermostatic action caused by fastening together two metals of unequal thermal expansion.

A strained tip will often crack when the tool is being ground, the cracks starting at one or more of the junctions between the steel shank and the tip and continuing more or less parallel with the brazing line, as indicated in Fig. 2. Although this type of crack may not spoil the tool, it definitely weakens the tip.

The most serious strain crack (as shown in Fig. 3) is one that develops during the use of

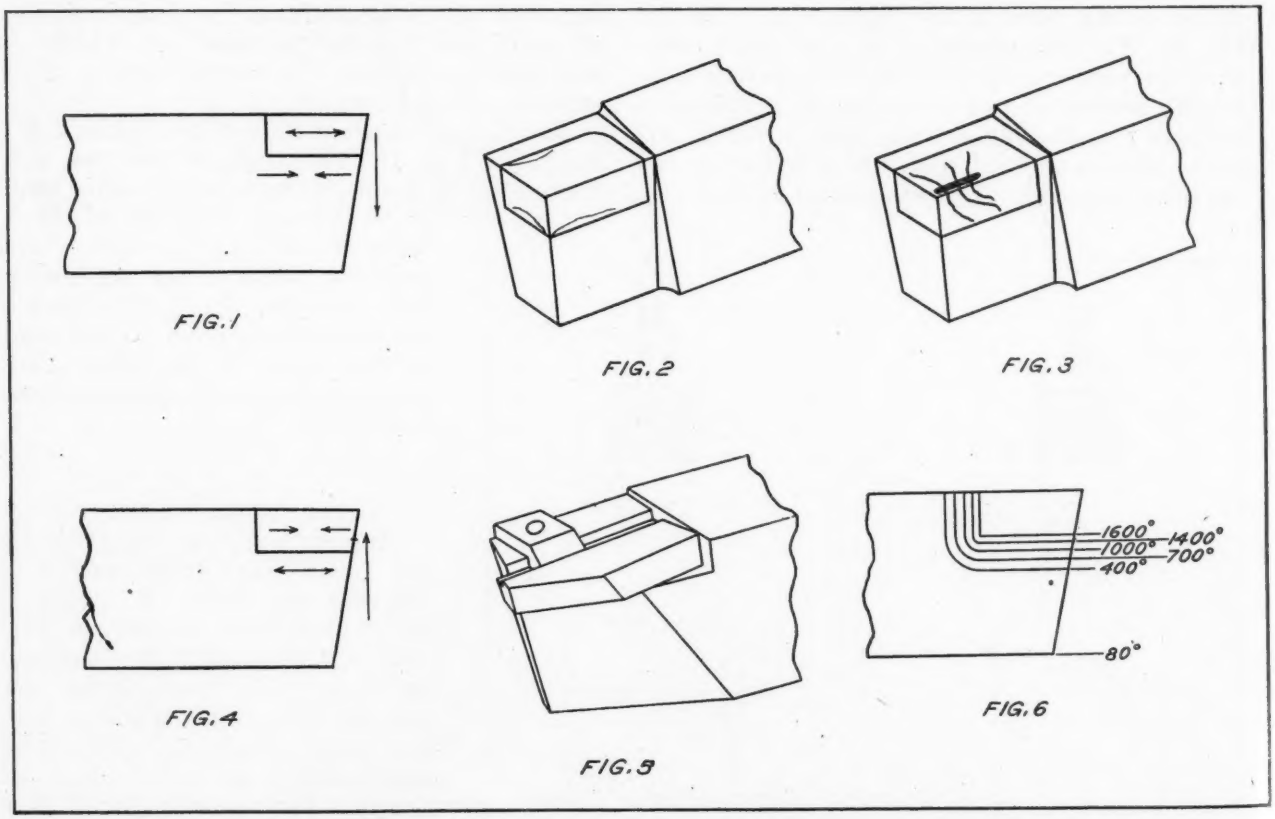


Fig. 1. Direction of Strains Produced by Conventional Brazing of Carbide Tools to Shanks. Fig. 2. Strain Cracks Caused by Uneven Contraction of Carbide Tip and Shank. Fig. 3. Cracks Produced by a Combination of Contraction Strains and Heavy Cut Pressure. Fig. 4. Strains Produced by Newly Developed Method of Brazing are in Opposite Direction to Those Indicated in Fig. 1. Fig. 5. Diagrammatic View of Carbide Tip Held by Clamp. Fig. 6. Temperatures of Steel Shank when Brazing is Done by New Method

the tool. This crack ruins the tool and often ruins the piece being machined, due to the fact that the broken end of the tool is forced into the work. The crack shown in Fig. 3 often results from extensions of thermal cracks in the cratered area.

Two methods have been developed for producing a tool that can be economically used on heavy cuts; in one, the tip is clamped to the shank by mechanical means, while in the other, the tip is brazed by a new method which produces strains the reverse of those shown in Fig. 1, as indicated by the arrows in Fig. 4.

The first method has been applied in many different designs, the most common one being a simple clamp pulled down on the tip with a screw, an adjusting screw being used to force the tip out successive amounts after regrinding. This tool, while originally expensive, is economical because the shank will outwear many tips. Another feature of this tool is that the tip only is reground, and a roughing wheel for grinding the shank is unnecessary. Since heavy cuts require a hard seat under the tip for proper support, the end of the shank should be hardened. A diagrammatic view of such a tool is shown in Fig. 5.

The other method of producing a suitable tool for heavy machining, as referred to in connection with Fig. 4, is a development of Newcomer Products, Latrobe, Pa. In this method, the main body of the steel shank under the tip is not heated. Fig. 6 shows typical temperature readings of the shank metal during brazing. Since the main body of steel under the tip is not heated, it does not expand as much as the tip, and when cooled after brazing, the tip contracts more than the steel, thus reversing the strains. When a carbide tip is brazed to a carbon-steel shank by this method, the sudden cooling of the area immediately under the tip hardens the seat, thus providing a very hard support for the carbide tip.

Although this type of brazing was intended primarily to prevent cracking under heavy cuts, it was soon noted that the wear of the cutting edge was also considerably reduced on many jobs. This decreased edge wear may be attributed to the fact that the wear on carbide tools often consists of minute crumbling of the edge, which is accelerated when the edge is under tensile strain.

The use of these tools has speeded up production considerably in many plants by decreasing the "down time" for changing tools, by eliminating scrap from gouged work caused by broken tools, and by permitting economical machining of large eccentric forgings in one cut, where formerly two roughing cuts were necessary. One large shell manufacturer states that 60 per cent of the tools brazed in the ordinary way broke on the first run on one of the roughing operations. By using the specially brazed tools here referred to, this company has increased production 42 per cent, having been able to obtain from three to ten grinds per tool with increased production per grind.

* * *

Zinc Die-Castings for Bomb Nose Pistols

Protection of Royal Air Force bombers against premature detonation of their cargoes of explosives was assured in the earlier phases of the war by American-made zinc-alloy die-cast safety caps. These caps were part of the nose-pistol assembly of British aerial bombs. Three zinc-alloy die-castings—the striker plate, the main body, and the protective cap—made up the complete nose-pistol assembly. These parts, particularly the main body casting, were of somewhat complicated design, and if made by other methods than die-casting would require considerable machining to prepare them for assembly. The safety cap is provided with a threaded, integrally cast steel stud.

Nose-pistol Assembly of Aerial Bomb, Showing Zinc-alloy Die-cast Safety Cap

The operation of the bomb nose pistol was comparatively simple. The safety cap was held in position by a pin while the bomb was in transit in the plane. Before the bomb was sent to its mark, the pin was quickly removed, leaving the cap free to spin off while in flight, exposing the striker plate of the fuse. The air vanes on the safety cap were so positioned, and the threads on the integrally cast stud were so designed, as to permit the cap to spin completely off, even when the bomb was delivered at low altitudes.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Return of Unsatisfactory Equipment

P. F.—About a year ago we purchased certain equipment for $3000. It was not satisfactory and we returned it to the seller. Now the seller is suing us for payment of $1500. Can the seller recover a money judgment since he accepted the equipment when it was returned?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

Many purchasers erroneously believe that, after ordering or contracting to purchase merchandise or equipment, they may return the purchased goods and receive full credit from the seller if the latter accepts redelivery. However, this is not the law. Recent higher court decisions hold that in the absence of fraud or an agreement giving the purchaser the right to rescind a contract or return the goods, the buyer may not absolutely rescind an executed contract of sale.

A case in point is that of Bedner, 176 S. W. (2d) 220, reported February, 1944, where a purchaser contested a suit on the grounds that he had returned a pump for which he had contracted to pay $1000, and that the seller gave him credit for only $500. There was no evidence that the returned pump was accepted by the seller with an agreement that the buyer would be credited with the full purchase price of $1000. However, the purchaser testified that the seller had accepted delivery of the pump, which still is in his possession and control, and that at no time did the seller state that he would not credit the purchaser with the full original price.

The Higher Court held that the seller was within his legal rights in crediting the purchaser's account with $500, instead of $1000. The Court decided that the returned pump was worth only $500 to the original seller and that since the purchaser did not prove that the seller had violated the original contract, the purchaser had no legal right to return the pump.

For reasons expressed in this recent higher court decision, I do not believe that you can do better than compromise this legal controversy for as much under $1500 as the seller will accept.

Hardened Rollers

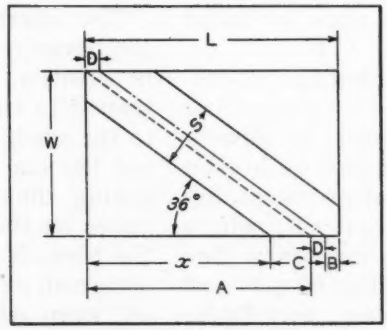
A. C. S.—We are making steel rollers 7 inches in diameter by 30 inches in length, which are required to have a hardness of not less than from 55 to 60 Rockwell C. What material would be most suitable to use in the production of these rollers?

Answered by Editor, "Nickel Steel Topics"
International Nickel Co., Inc., New York City

In the absence of any further details than those given in the question above, it is recommended that the rollers be made from a low-carbon alloy steel, such as S A E 4320, 3312, 2515, or NE 9915. The rollers should be finish-machined, carburized to obtain the necessary depth of case, and quenched directly from the carburizing box. This treatment should produce a hardness of from 60 to 63 Rockwell C, with a strong shock-resisting core.

A Mathematical Problem

H. J.—The accompanying illustration shows a rectangular block through which a slot has been cut at an angle of 36 degrees with the longer sides of the rectangle. The center line of the slot passes through the center of the block. The length L and width W of the block and the width S of the slot are known. What is the length of dimension x?



Rectangular Block with Slot Cut through it; Dimension "x" is to be Computed

Answered by John Homewood
Ontario, Calif.

Dimensions A, B, C, and D are unknown. Dimension x is found as follows:

$$A = \frac{W}{\tan 36^\circ}; \quad L - A = B + D$$

But $B = D$, since the center line of the slot passes through the center of the block. Hence,

$$B = \frac{L - A}{2}; \quad C = \frac{1/2\,S}{\sin 36^\circ}$$

$$x = L - (B + C)$$

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 197 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the October, 1945, Number of MACHINERY

Heat-Treating Equipment

GEHNRICH OVEN DIVISION of the W. S. ROCKWELL CO., 108 Jewel St., Brooklyn 22, N. Y. Catalogue 115, descriptive of Gehnrich heat-treating ovens for ferrous and non-ferrous products. Catalogue 116, describing oven construction, with particular reference to the insulated dual panel assembly. 1

Tools and Gages

PRODUCTS ENGINEERING CO., 9045 Wilshire Blvd., Beverly Hills, Calif. Folders 7 and 8 on self-adjusting toggle clamps and drill jig bushings, respectively. Catalogues 10 and 11, on aircraft tools and machinists tools and gages, respectively. Also Simplified Jig Drill Bushing Conversion Data Sheet. 2

Hydraulic Units

JOHN S. BARNES CORPORATION, 301 S. Water St., Rockford, Ill. Bulletin 013-G, entitled "Pointers on Installation and Maintenance of Barnes Hydraulics." Leaflet descriptive of Barnes self-contained Type 139 hydraulic unit for light-duty applications. 3

Industrial Visual Equipment

BAUSCH & LOMB OPTICAL CO., Rochester, N. Y. Catalogue entitled "Vision in Industry," describing the Bausch & Lomb industrial vision service, by means of which the visual performance of employes can be measured to fit them to the proper job. 4

Casting Salvaging Equipment

METALLIZING CO. OF AMERICA, Industrial Division, 1330 W. Congress St., Chicago 7, Ill. Bulletin C-1A, describing the new Mogul M-1500 circulator, which makes possible the low-cost salvage of castings rejected because of porosity or pin-hole cracks. 5

Machine Tools, Small Tools, and Gages

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford 1, Conn. Condensed catalogue covering the complete line of Pratt & Whitney products—machine tools, small tools, and gages. 6

Grinding and Finishing

MINNESOTA MINING & MFG. CO., 900 Fauquier Ave., St. Paul 6, Minn. 12-page booklet entitled "A Faster, Better Finishing Method for Metal, Plastic, or Glass," describing the 3-M "Wetordry" method of precision grinding and finishing at high speeds. 7

Protective Coating for Metal

BETTER FINISHES AND COATINGS, INC., 168 Doremus Ave., Newark 5, N. J. Booklet descriptive of a plastic film known as "Liquid Envelope," which serves as a protective coating for metal equipment and materials in transit or in storage. 8

Flexible-Shaft Machines

WYZENBEEK & STAFF, INC., 840 W. Hubbard St., Chicago 22, Ill. Catalogue 44, on flexible-shaft machines and equipment for toolrooms, machine shops, pattern shops, foundries, welding and repair shops, etc. 9

Electric Industrial Equipment

WALKER-JIMIESON, INC., 311 S. Western Ave., Chicago 12, Ill. Booklets on voltage supply equipment, lighting equipment, shop tools, electrical maintenance equipment, and testing and inspection equipment. 10

Gear-Cutting on a Milling Machine

CINCINNATI MILLING MACHINE CO., Cincinnati 9, Ohio. Booklet M-1397, entitled "Cutting Gear Teeth on a Milling Machine," containing data applying to any make of milling machine. 11

Tables for Computing Change-Gears

MICHIGAN TOOL CO., 7171 E. McNichols Road, Detroit 12, Mich. Bulletin T-45, new edition of a booklet of tables for computing change-gears for hobbing machines for helical gears. 12

Quality Control

FEDERAL PRODUCTS CORPORATION, 1144 Eddy St., Providence 1, R. I. Publication entitled "Federal Dimensional Quality Control Primer," a simplified method for applying statistical quality control to dimensions. 13

Brass, Bronze, and Iron Alloys

CRAMP BRASS & IRON FOUNDRIES DIVISION, BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa. Catalogue giving the composition, applications, and physical properties of thirty-two brass, bronze, and iron alloys. 14

Tap Guide

WOOD & SPENCER CO., Cleveland 3, Ohio. "Tap Guide," containing data on taps, including pitch tolerances, tap drill sizes, machin-

ability ratings of various metals, cutting fluid recommendations, cutting speeds, etc. 15

Parts for Jigs, Fixtures, and Dies

JERGENS TOOL SPECIALTY CO., 15957 Euclid Ave., Cleveland 12, Ohio. 48-page catalogue of component parts and accessories for jigs, fixtures, and dies; also special machinery. 16

Coloring and Blackening Processes for Metals

ENTHONE CO., Department M, New Haven 2, Conn. Booklet describing the Ebonol coloring processes for copper and copper alloys and blackening processes for zinc and steel. 17

Special-Purpose Alloy Steels

CARPENTER STEEL CO., 305 W. Bern St., Reading, Pa. Booklet entitled "Fitting the Steel to the Job," containing data on the selection of alloy steels to meet specific requirements. 18

Extensible-Tip Belt Splice

MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC., Passaic, N. J. Bulletin 6861, describing Manhattan extensible-tip splice for Condor endless belts, designed to relieve stress. 19

Bronze Bushings, Bearings, and Bar Stock

SHOOK BRONZE CORPORATION, Greenlawn and Lake Sts., Lima, Ohio. Catalogue 45, on bronze bushings, bearings, bar stock, and babbitt. 20

Reconversion Data

ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wis. Three bulletins describing how to take a reconversion inventory of electric motors, centrifugal pumps, and V-belt drives. 21

Stainless Steel

RUSTLESS IRON & STEEL CORPORATION, 3400 E. Chase St., Baltimore 13, Md. Bulletins on rustless blackening process for stainless steels, and on electro-polishing of stainless steels. 22

Tramrail Systems

FORKER CORPORATION, 1812 E. 47th St., Cleveland 3, Ohio. Booklet on Ohio tramrail systems, analyzing material-handling costs and illustrating and describing equipment available. 23

Electrical and Automotive Products

WAGNER ELECTRIC CORPORATION, 6467 Plymouth Ave., St. Louis 14, Mo. Folder GU-86, briefly describing the company's line of electrical and automotive products. 24

Automotive and Industrial Parts

WEATHERHEAD CO., 300 E. 131st St., Cleveland 8, Ohio. Automotive and industrial products catalogue, covering the extensive line of parts made by this company. 25

Keyway Cutters

WIESE CO., 1507 Fifth St., Perry, Iowa. Circular describing the B&W keyway cutter—a low-cost device for cutting keyways any width, length, and depth, in shafts up to 2 1/16 inches in diameter. 26

Ball-Bearing Testing Machine

PHYSICISTS RESEARCH CO., Department 2, 343 S. Main St., Ann Arbor, Mich. Bulletin describing the Anderometer, a production instrument for testing complete ball bearings. 27

Heat-Treatment

AJAX ELECTRIC CO., INC., Frankford Ave. at Delaware Ave., Philadelphia 23, Pa. Bulletin entitled "Salt Baths for Process Annealing, Cyclic Annealing, and Descaling." 28

Checking Machine

INTERLAKES ENGINEERING CO., 3226 Drexel Ave., Detroit 15, Mich. Circular illustrating and describing the "Super-Chek" for automatically checking the dimensions of parts. 29

Printer-Developers

CHARLES BRUNING CO., INC., 4754 Montrose Ave., Chicago 41, Ill. Circular descriptive of the new Bruning Model 41 printer-developer for making black and white prints. 30

Plastic Nameplates and Dials

PENNSYLVANIA PLASTICS CORPORATION, 5025 Liberty Ave., Pittsburgh 24, Pa. Circular on "Everclear Everstick" plastic plates for dials, nameplates, instrument panels, etc. 31

Sump Tank Cleaning Equipment

W. R. CARNES CO., Madison 4, Wis. Folder illustrating and describing the Carnes centrifugal clarifier for assuring constant flow of oil or coolant, free from dirt. 32

Boring Tools with Micrometric Adjustment

STATE MFG. & CONSTRUCTION CO., 1961 N. Dixie Highway, Franklin, Ohio. Circular descriptive of recent additions to the line of "Dialset" boring tools. 33

Welding in Machine Design

LINCOLN ELECTRIC CO., Cleveland 1, Ohio. Application Sheet No. 94 in a series on machine design, describing a precision tapping machine of welded design. 34

Automatic Screw Machines

GREENLEE BROS. & CO., 1869 Mason Ave., Rockford, Ill. Booklet illustrating and describing Greenlee automatic screw machines and attachments. 35

Grinding Wheel Segments

A. P. DE SANNO & SON, INC., 428 Wheatland St., Phoenixville, Pa. Folder S-1, containing information on Por-os-way segment grinding wheels. 36

Heat-Treatment of Steel

PERFECTION TOOL & METAL HEAT-TREATING CO., 1740-58 W. Hubbard St., Chicago 22, Ill. Booklet entitled "Fifty Facts—Better Hardening, Better Results." 37

Hydraulic Equipment

WATSON-STILLMAN CO., Roselle, N. J. Bulletin 510-A, on hydropneumatic pit jacks and drop pit tables; 560-A, on hydraulic railroad equipment. 38

Tool Steels

ALLEGHENY LUDLUM STEEL CORPORATION, Brackenridge, Pa. 170-page catalogue and manual entitled "The Tool Steels of Allegheny Ludlum." 39

Air Motors

BELLOWS CO., 861 E. Tallmadge Ave., Akron 10, Ohio. Circular

covering Bellows reciprocating air motors for pulling, pushing and lifting operations. 40

Crush Form Precision Contour Grinding

THOMPSON GRINDER CO., INC., Department 40, Springfield, Ohio. Booklet entitled "Facts about Crush Form Grinding Precision Contours." 41

Safety Blocks for Power Presses

DOW CHEMICAL CO., Midland, Mich. Bulletin on Dowmetal safety blocks for sheet-metal forming presses. 42

Ball Reciprocating Bearings

TORRINGTON CO., BANTAM BEARINGS DIVISION, South Bend 21, Ind. Bulletin 105, descriptive of high-capacity ball reciprocating bearings. 43

Electronic Motor Controls

ELECTRON EQUIPMENT CORPORATION, 917 Meridian Ave., South Pasadena, Calif. Bulletin 178, on electronic motor controls for industry. 44

Motor-Generator Maintenance Equipment

IDEAL COMMUTATOR DRESSER CO., Sycamore, Ill. Catalogue MMH-645, on motor-generator maintenance and repair equipment. 45

Ball Bearings

OMEGA MFG. CO., 187-189 Cottage St., Poughkeepsie, N. Y. Catalogue covering the Omega line of ball bearings and ball-bearing rollers. 46

Form Tools

COLONIAL TOOL CO., LTD., Windsor, Ontario, Canada. Bulletin D-45, showing the Colonial line of form tools and relieved form cutters for gears, threads, worms, etc. 47

Drill Jigs and Fixture Locks

SIEWEK TOOL DIVISION OF DOMESTIC INDUSTRIES, INC., 231 S. LaSalle St., Chicago, Ill. Catalogue 6-J, on standard drill jigs, fixtures, and fixture locks. 48

Precision Drilling Machines

ELECTRO-MECHANO CO., 261 E. Erie St., Milwaukee 2, Wis. Circular illustrating and describing the Electro-Mechano high-speed precision drill press. 49

Metal Spinning

MILWAUKEE METAL SPINNING CO., Milwaukee 14, Wis. Spincraft Data Book No. 2, giving information on metal spun products. 50

Vibration Control

KORFUND CO., INC., 48-15 Thirty-Second Place, Long Island City 1, N. Y. Bulletin "Vibration in Industry, Its Effect and Control." 51

Stainless Strip Steels

SUPERIOR STEEL CORPORATION, Carnegie, Pa. Bulletin containing technical data on hot- and cold-rolled stainless strip steels of value to designers and fabricators. 52

Heating and Melting Equipment

AJAX ELECTROTHERMIC CORPORATION, Ajax Park, Trenton 5, N. J. Bulletin entitled "Ajax-Northrup Heating and Melting." 53

Multi-Clamps

GEORGE K. GARRETT CO., INC., 1421 Chestnut St., Philadelphia 2, Pa. Folder descriptive of Diamond G multi-clamps for a wide variety of uses. 54

Thread Milling Cutters

DETROIT TAP & TOOL CO., 8432 Butler Ave., Detroit 11, Mich. Bulletin CB-45, covering the expanded line of Detroit standard thread milling cutters. 55

Diamond Grinding Wheels

PRECISION DIAMOND TOOL CO., 30 W. Washington St., Chicago, Ill. Catalogue 44 on a new development in diamond wheels. 56

V-Belt Matching Machine

SMITH POWER TRANSMISSION CO., 1545 E. 23rd St., Cleveland 14, Ohio. Bulletin on the "Flexoid" V-belt matching machine. 57

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Grinding Cylinders and Segments

NORTON CO., Worcester 6, Mass. Circular on Norton cylinders and segments for surface grinding.....58

Shankless Twist Drills

REPUBLIC DRILL & TOOL CO., 322 S. Green St., Chicago 7, Ill. Manual S-4 (40 pages), on shankless roll-forged drills. 59

Broaching Machines

COLONIAL BROACH CO., P. O. Box 37, Harper Station, Detroit 13, Mich. Bulletin VMS-45, on pull-down broaching machines. 60

Pressure Castings

MEEHANITE RESEARCH INSTITUTE, Pershing Square Building, New Rochelle, N. Y. Bulletin on Meehanite pressure castings. 61

Corrosion-Resistant Materials

U. S. STONEWARE, Tallmadge Circle, Akron, Ohio. Bulletin H, on corrosion-resistant materials and equipment. 62

Toggle Clamps

MECHANICS ENGINEERING CO., Box 243, Jackson, Mich. Bulletin on Mech-Master toggle clamps.....63

Welding Electrodes

ALLOY RODS CO., York, Pa. 20-page catalogue on stainless-steel arc-welding electrodes. 64

Welding Rod

AMPCO METAL, INC., Milwaukee 4, Wis. Bulletin W-2, on "Ampco-Trode" welding, using coated aluminum-bronze weld rod. 65

Broaches

CONTINENTAL TOOL WORKS, Detroit 6, Mich. Bulletin entitled "In Broaching, a Good Tool Comes First!" 66

Seamless Tubing

TUBE REDUCING CORPORATION, Wallington, N. J. Bulletin on Rockrite close-tolerance, cold-reduced seamless tubing. 67

Packing for Air and Hydraulic Cylinders

DARLING VALVE & MFG. CO., Williamsport, Pa. Bulletin on Darcova "Pumcups." 68

Grinding-Wheel Accessories

AMERICAN EMERY WHEEL WORKS, Providence 1, R. I. Folder on grinding wheel accessories for portable tools. 69

Rolled-Steel Shapes

LUKENWELD, INC., 272 Lukens Bldg., Coatesville, Pa. Bulletin on special rolled-steel shapes. 70

Conveyors

LINK-BELT CO., 307 N. Michigan Ave., Chicago, Ill. Bulletin 2088, on oscillating-trough conveyors. 71

Blast Nozzles

AMERICAN FOUNDRY EQUIPMENT CO., 500 S. Byrkit St., Mishawaka, Ind. Catalogue 27, on Norbide, Heanium, and V-Metal blast nozzles. 72

Milling-Drilling Tools

STEEL TOOLS, INC., 2307 Prospect Ave., Cleveland 15, Ohio. Leaflet on the Micro-King "Mill-Drill" for plastics or sheet metals. 73

Buffing Wheels

UDYLITE CORPORATION, Detroit 11, Mich. Circular on Udylite buffing wheels of various compositions for all requirements. 74

Gears and Speed Reducers

FALK CORPORATION, 3001 W. Canal St., Milwaukee 8, Wis. Publication entitled "The Story of a Good Name in Industry." 75

Small Interchangeable Motors

ROBBINS & MYERS, INC., Springfield, Ohio. Bulletins 10-A, 10-B, and 10-C on small interchangeable motors. 76

Metal Sawing Handbook

W. O. BARNES CO., INC., 1297 Terminal Ave., Detroit 14, Mich. 48-page handbook on metal sawing...77

Electrode-Holders

GENERAL ELECTRIC CO., Schenectady 5, N. Y. Bulletin on G-E armor-clad electrode-holders. 78

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on page 199-228 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in October, 1945, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on other side of this blank.

Detach and mail to MACHINERY, 148 Lafayette St., New York 13, N. Y.

[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Lodge & Shipley Automatic Lathe for Small Work

An automatic lathe designated the 2A Duomatic has been developed by the Lodge & Shipley Machine Tool Co., 3084 Colerain Ave., Cincinnati 25, Ohio, for faster production, combined with greater accuracy, in the machining of small work in either large- or small-lot runs. This lathe has been designed for full-automatic handling of small work by the efficient methods previously made available for machining large work on the 3A Duomatic. Although designed for the production field in which a small-sized automatic lathe is needed, the new 2A Duomatic retains all the features of the larger more powerful 3A machine. Recent developments incorporated in the 2A machine are said to make more effective use of multiple tools in turning, as well as in straight and angular facing operations.

This lathe is especially adapted for quantity production work on parts held between centers, on an arbor, or in suitable chucks or fixtures, and is equally adaptable for handling similar classes of work in small-lot runs. As the name implies, the 2A Duomatic is of dual construction, there being a complete front carriage and tool-slide and a complete rear carriage and tool-slide, each independently actuated by its own feed-screw. This construction makes it possible for a single machine to serve the practical purposes of two lathes in the handling of many production jobs.

The feed and traverse mechanisms provide forward and return traverse movements. A wide range of mechanical feeds is available through pick-off gears. Pause or dwell adjustments are included, and a graduated dial is provided for determining the length of the power forward traverse movement. Provision is also made for disengaging the power feed during the operating cycle whenever it is necessary to return the tools to the starting point. A separate clutch lever enables the operator to set up the machine manually for the required cycles through the rotation of a handwheel at the tailstock end of each feed-screw. Control levers enable the operator to start the spindle and the operating cycles independently from the front or from the rear, or simultaneously from the front. All set-ups are mechanical, no cams being required to change the operating cycle.

Various other construction and operating features include tool-slides that can be swiveled to any angle on the graduated tool-slide bases; wide double-wall bed with elliptical girths that assure maximum rigidity; automatic lubrication for headstock, driving pulley and feed, and control mechanism; heavy-duty tailstock with built-in revolving center; pause at end of cut; and an arrangement by which stopping of spindle during operating cycle stops both carriage movement and tool-slide travel, all of which facilitate production.

Principal specifications are: Swing

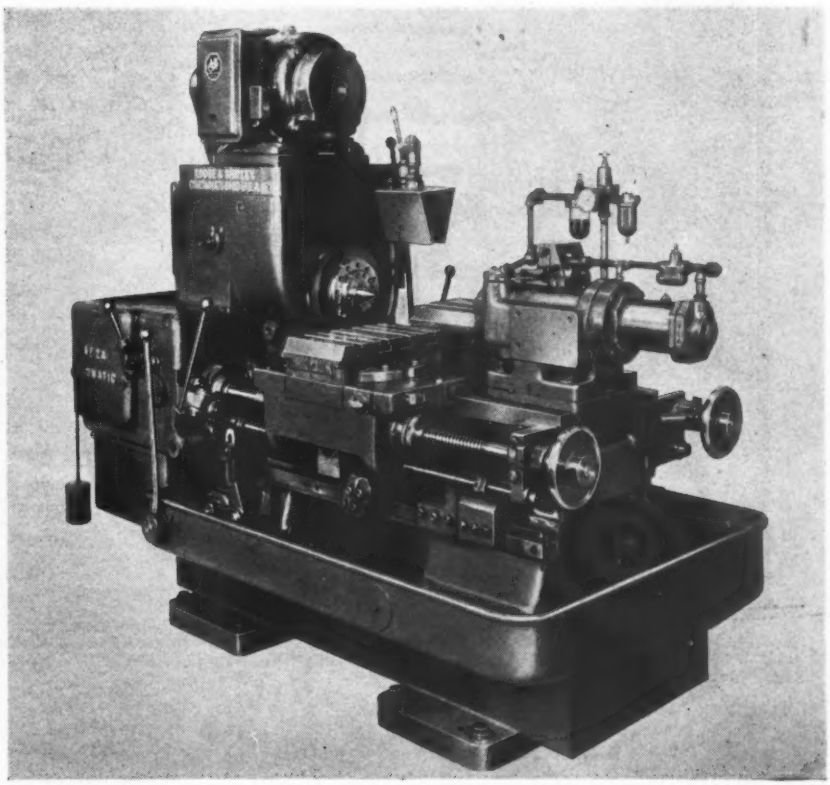


Fig. 1. Duomatic Lathe Developed by the Lodge & Shipley Machine Tool Co. for Fast Production of Small Work

To obtain additional information on equipment described on this page, see lower part of page 198.

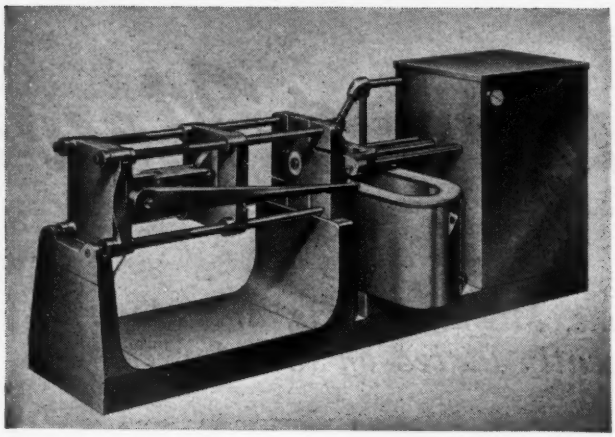


Fig. 1. Harvill Die-casting Machine Equipped for Air Injection and Manual Opening of Dies

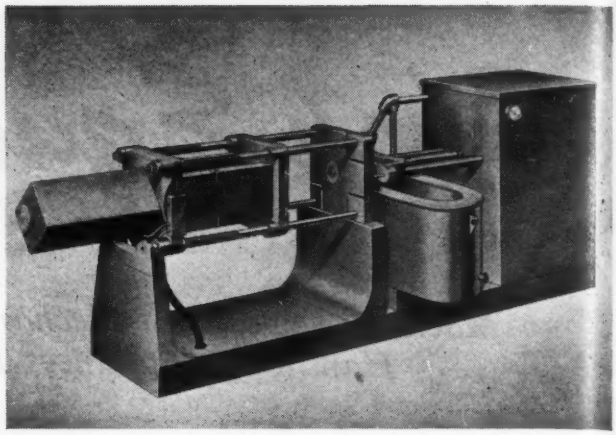


Fig. 2. Harvill Automatic Air-operated Machine for Die-casting Tin, Lead, and Zinc Alloys

over bed, 20 3/4 inches; swing over front or rear cross-slide, 9 1/2 inches; normal distance between centers, 15 inches, but provision is made for increasing this capacity in increments of 6 inches; hole through the spindle, 2 1/8 inches in diameter; feed range, from 0.003 to 0.050 inch. Spindle speeds are dependent upon the change-gears and the driving pulley selected, ranging from 50 to 2000 R.P.M. The driving motor sizes range from 5 to 20 H.P. 81

Harvill Die-Casting Machines

A new line of die-casting machines incorporating improvements based on production experience gained during the war has been developed by the H. L. "Red" Harvill Mfg. Co., P.O. Box 335, Vernon, Calif. The machines shown in Figs. 1 and 2 are the first of this new line of four basic models developed to cover the full range of die-casting requirements.

The machine shown in Fig. 1 (Model HD-1AM1) is designed for high efficiency in the production of small to medium size castings of tin, lead, and zinc alloys. It embodies all the outstanding features of the larger machines, except that the dies are opened and closed manually. Production rates as high as 400 cycles per hour have been attained with this equipment. Injection is accomplished by an air-operated horizontal ram.

This machine will accommodate dies having a vertical dimension of 8 inches and a horizontal dimension of 12 inches. The maximum die thickness with the dies closed is 14 inches, and the distance between the dies when open is 6 1/4 inches. Each "shot" injects 3 pounds of zinc under normal conditions, but up to 6.1 pounds per zinc can be injected when oversize dies are employed. A pressure of 1200 pounds per square inch is exerted on the metal in the die when less than 3 pounds of zinc is injected.

In using a large injection piston for maximum metal injection, the pressure on the metal is 600 pounds per square inch. About 1 cubic foot of air per minute at a pressure of 150 pounds per square inch is required to operate the machine at 400 cycles per hour. The machine is 3 feet wide, 8 feet long, and 3 1/2 feet high, and requires an operating floor space of 10 by 18 feet.

The HDA series automatic air-operated die-casting machine shown in Fig. 2 is designed for semi-automatic and fully automatic high-speed die-casting of zinc, tin, and lead alloys. Injection of the metal into the die cavity with this ma-

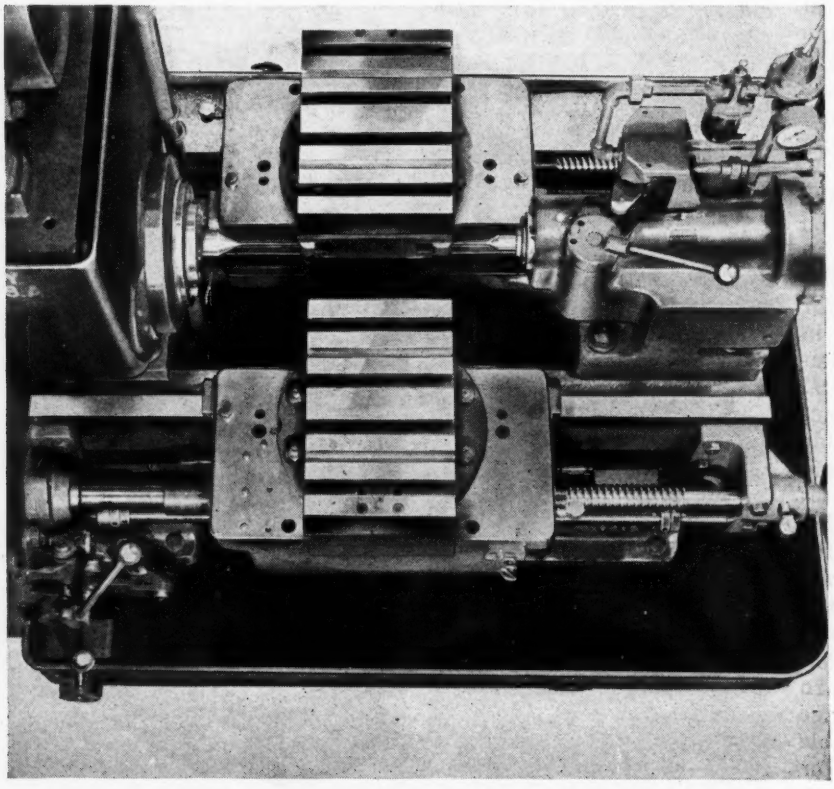


Fig. 2. Close-up View of Front and Rear Carriages and Tool-slides of New Duomatic Shown in Fig. 1

To obtain additional information on equipment described on this page, see lower part of page 198.

chine is accomplished by an air-operated ram developing as much as 1410 pounds per square inch pressure on the metal during the period of solidification. This high pressure serves to produce parts having a fine surface finish and a uniform size within close limits.

The sizes in which this machine is available will accommodate a die having a horizontal dimension of 12 to 24 inches, and a vertical dimension of 8 inches for the smallest size and 16 1/2 inches for the largest size. The die thickness may vary from 14 inches in the smallest to 22 inches in the largest machine, with a die opening of 6 1/4 inches between the die faces in the small machine and 12 inches in the large one. These machines cover a casting capacity range of from 6.1 to 21.2 pounds of zinc-base alloy metal. ——82

Hy-Mac Machines for Broaching Split-Line Bearings

A special-purpose machine for broaching the inside diameter and split-line surface of automatic type precision half-bearings has just been built by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. The operating cycle of this vertical type machine is entirely automatic, except for loading and unloading and the pressing of two "palm-buttons," which are provided as a safety feature to protect the operator's hands.

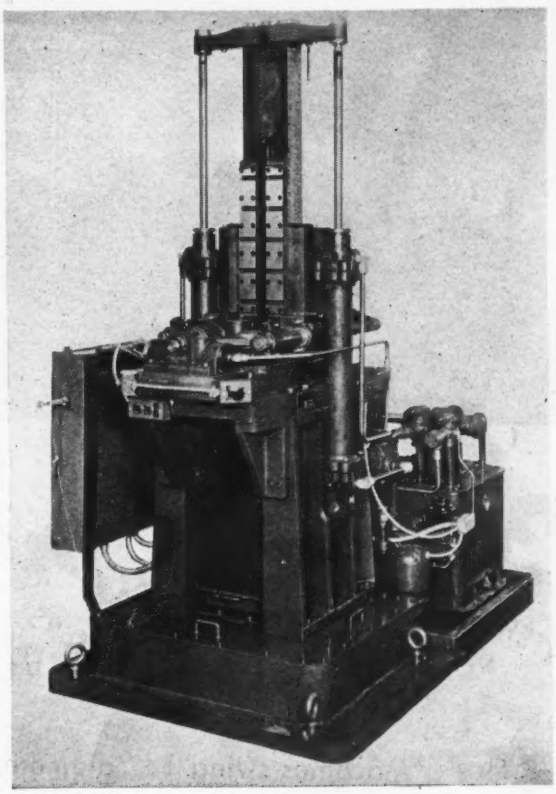
After the "palm-buttons" have been pressed, the automatic cycle is as follows: The nest block moves in and clamps the bearing; nest block is locked in position; broaching slide moves down, its stroke being adjustable through dogs which engage limit switches; nest block is unlocked and returned to loading position; and broaching slide is moved up again. The bearing is then unloaded manually.

The machine is driven by a Hy-Mac hydraulic power unit, the cycle being controlled by hydraulic sequence valves, solenoid-operated four-way valves, pressure switches, limit switches, and a special electrical control panel. The movement and locking of the nest block are accomplished by special cylinders built into the side of the block. The movement of the broaching slide is produced by two swivel type cylinders with adjustable cushions at both ends. Built into the base of the machine are a coolant pump and sump. Directly under the broaching station are located two metal baskets, the first for catching chips and the second for screening the coolant.

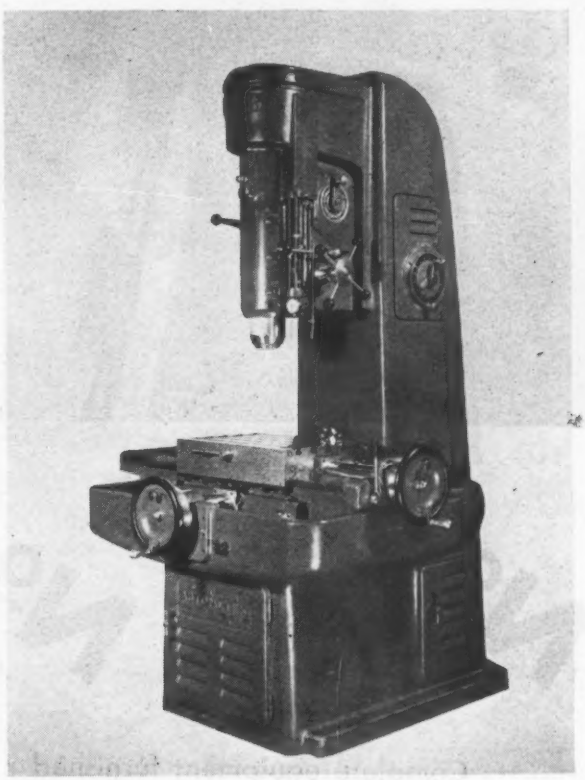
The advantages claimed for this special-purpose machine include high production, positive alignment and clamping of bearings, adaptability to different sizes of nests for various sizes of bearings, and adjustable broaching speed. ——83

Milwaukee "Autometric" Boring Machine

The Kearney & Trecker Products Corporation, Milwaukee 14, Wis., has brought out a Model C Milwaukee "Autometric" boring machine, designed to handle a wide variety of precision boring ranging from the finest tool-room work to precision production jobs. The bed, column, and chip guard of this machine are cast in one unit, and the



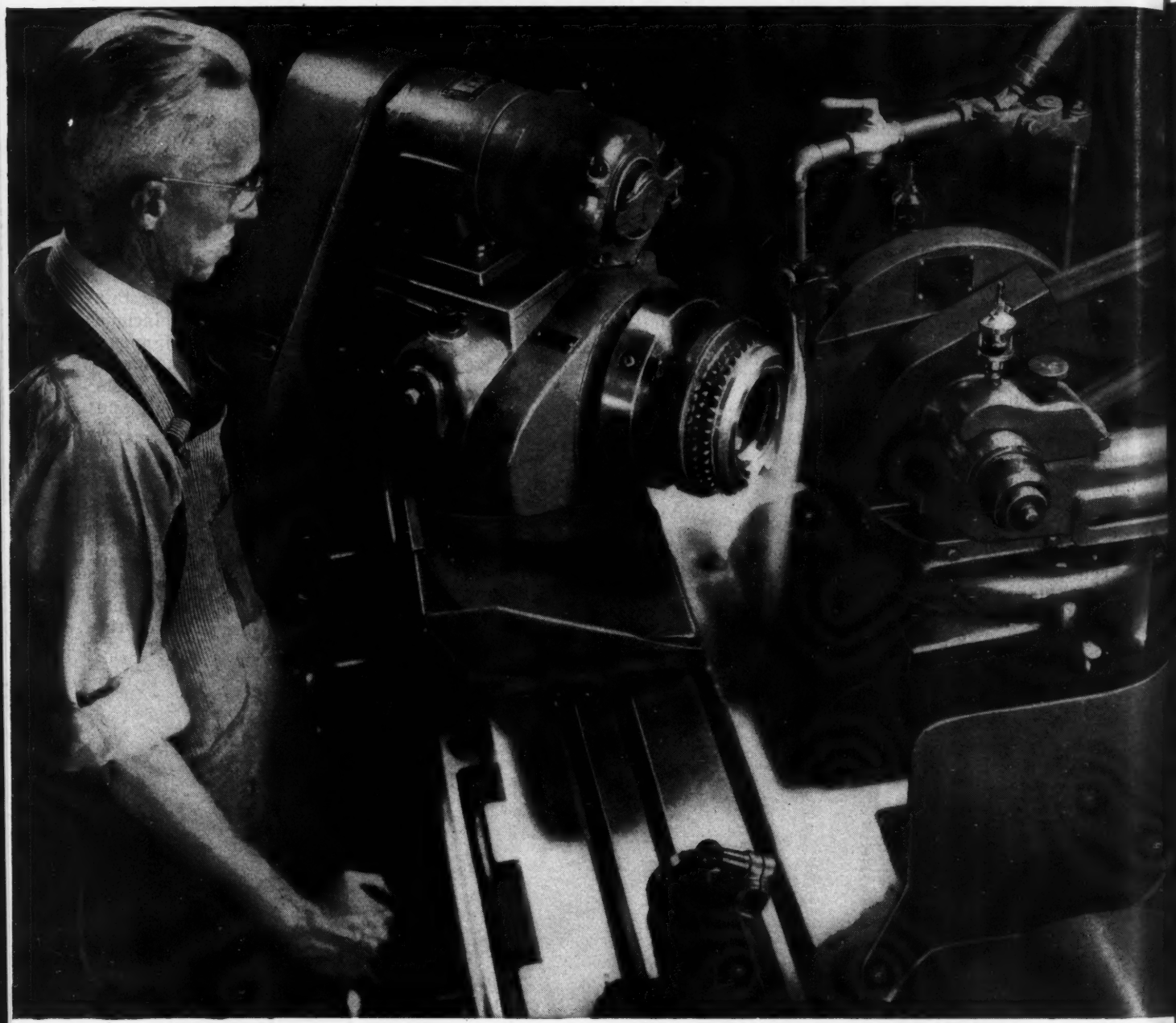
Special-purpose Machine for Broaching Split-line Bearings, Built by Hydraulic Machinery, Inc.



Milwaukee "Autometric" Boring Machine Brought out by Kearney & Trecker Products Corporation

To obtain additional information on equipment described on this page, see lower part of page 198.

FASTER SET-UPS . . EASIER OPERATION



No 2 CENTERS* TAKE 30" LENGTH

No 3 CENTERS* TAKE 40" LENGTH

No 4 CENTERS* TAKE 60" LENGTH

Complete equipment furnished with each machine adapts it to a wide variety of work

*Machines swing 14" diameter over table — 12¾" diameter over water guards

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Dependable grinding on all types of Toolroom and Production jobs–

CYLINDRICAL
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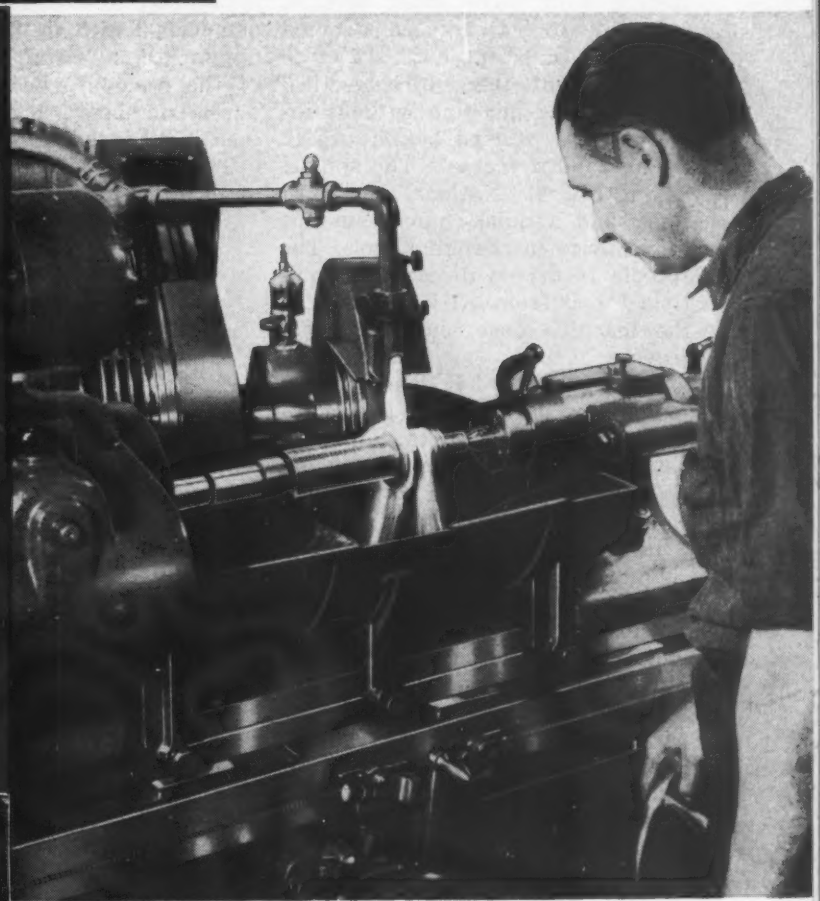
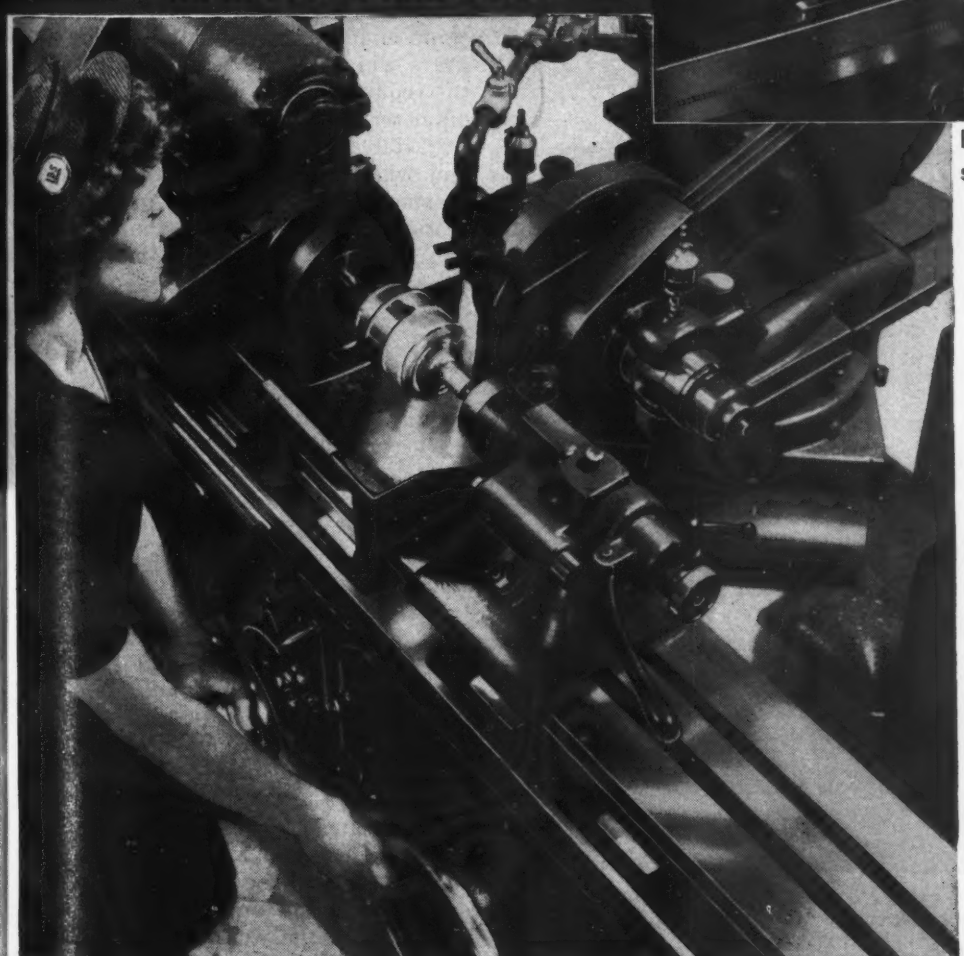
– Highly profitable through
Simplicity of design
Efficient performance
Minimum maintenance





Equipment for Right-Hand Wheel Mounting shown above . . . furnished as an extra

Check your savings in time and effort through the use of these versatile Universal Grinding Machines on your precision work.

B·S BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

SHARPE

stationary boring spindle head is mounted on the machine column to provide a long bearing for the spindle quill. The head, spindle, and quill are specially constructed to permit sufficient quill travel to take care of the entire vertical range of the machine without increasing its over-all height, which is only 90 1/2 inches. The spindle has a No. 40 National Standard taper and a quick-change nut for convenience in changing tools. The spindle is driven directly by multiple V-belt from a 1-H.P. motor in the machine base, and the rapid traverse mechanism for the quill is driven by a 1/4-H.P. motor.

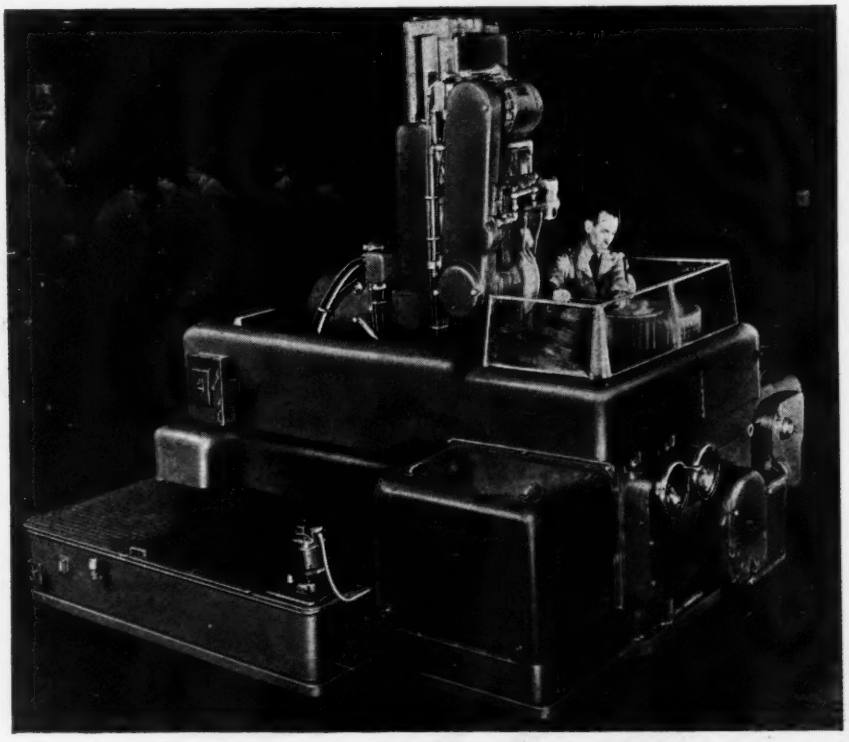
The precise transverse and longitudinal movements of the table are obtained by precision measuring screws equipped with large-diameter micrometer dials and verniers with 0.0001-inch graduations. Mechanical counters, which are set at zero during the initial set-up, show the exact table position in inches and tenths of an inch. The five-pitch measuring screws give the table a movement of 0.2000 inch per revolution.

A lubricating system meters circulating oil to most of the running parts, including the spindle bearings. The outstanding features claimed for this machine include a high degree of accuracy, rigidity, and simplicity of operation. The lead of the measuring screws is accurate to 0.0001 inch in 1 inch and 0.0002 inch in 12 inches. All alignments affecting the accuracy of the work are held to within a non-accumulative error of 0.0002 inch in 12 inches.

The table has a working surface of 14 by 22 1/2 inches, a transverse travel of 12 inches, and a longitudinal travel of 18 inches. The maximum distance from the table top to the spindle nose is 17 inches, and the vertical quill travel is 11 inches. The spindle speeds are infinitely variable from 50 to 2500 R.P.M. Eight quill feeds are available, ranging from 0.0005 to 0.0148 inch per revolution of the machine spindle. ---------- 84

Pratt & Whitney Universal Gear Grinder for Spur or Helical Gears

A 26-inch universal gear grinder for both spur and helical gears has been brought out by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. This vertical type hydraulically operated machine handles gears up to a maximum diameter of 30 inches, having a diametral pitch range of 2 to 12, with either right- or left-hand helix angles up to 35 degrees and a maximum face width of 10 inches. The indexing mechanism provides for grinding any number of teeth from 5 to 190, except for a few prime numbers above 83. A 6 1/8-inch hole through the rotary table permits holding gears with integral shanks.



Pratt & Whitney Hydraulically Operated Universal Gear Grinder for Spur or Helical Gears

Operation of the new machine is similar in principle to that of the Pratt & Whitney 10-inch horizontal type gear grinder in that both produce involute profiles by rolling the pitch circle of the gear being ground upon an imaginary pitch line with a gear tooth in contact with a reciprocating V-form grinding wheel which simulates one tooth of a generating rack.

Instead of the master rack and master gear method employed on the earlier machine for producing the rolling generating motion of the gear being ground, the new machine employs a system of change-gears which can be selected to give the required range of pitches, pitch diameters, and tooth numbers. The work-table is rotated by a worm and wheel, and is supported on a carriage which is moved in a direction perpendicular to the work axis by means of a screw. Indexing is obtained through a one-tooth clutch in the change-gear train which drives the rotary table, the functioning of this clutch being indicated by a tell-tale lamp for the operator's convenience.

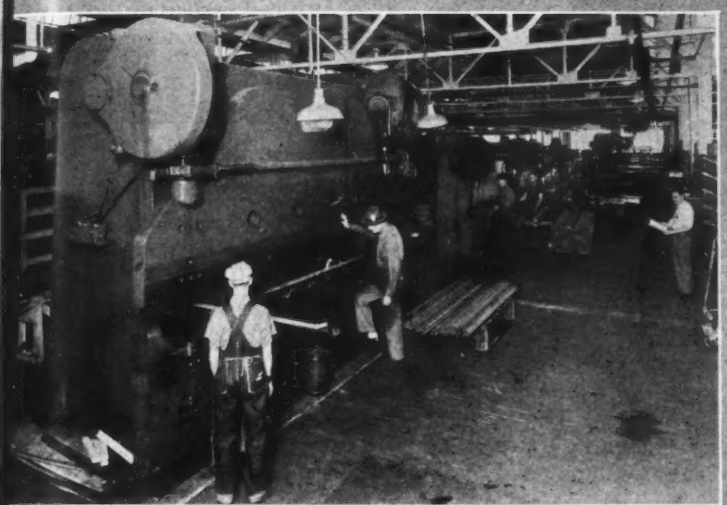
The wheel-spindle, wheel driving motor, and motor-driven wheel-dressing device are carried on the vertical ram. The wheel-dressing device uses three diamonds, one for each side of the vee profile of the wheel, which can be set for any pressure angle from 13 to 30 degrees, and one for dressing a flat across the top of the vee profile or a flat with a radius at each corner as required.

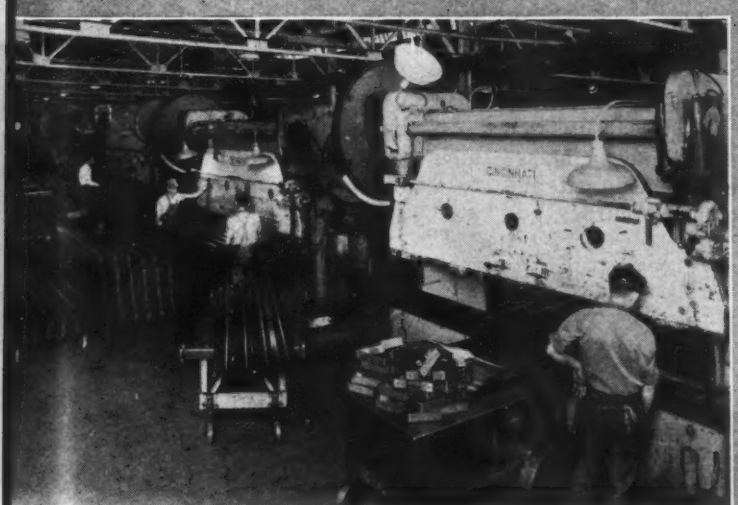
The machine occupies a floor space of 107 by 135 inches, weighs approximately 20,000 pounds, and is equipped with Lucite guards which enclose the coolant spray during grinding and yet permit a full view of the work. ---------- 85

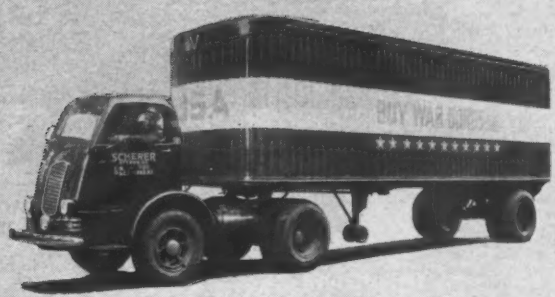
To obtain additional information on equipment described on this page, see lower part of page 198.

"TRAILBLAZERS"

Grow on this line . . .







Long line! Long parts! Short time! That is the nutshell story of Trailblazer production. Nearly a tenth of a mile of Shears and Brakes meets this intensive production problem. This team of Cincinnati Shears and Cincinnati Press Brakes, with their accurate performance and ample working lengths, smoothly and economically handles the long pieces required.

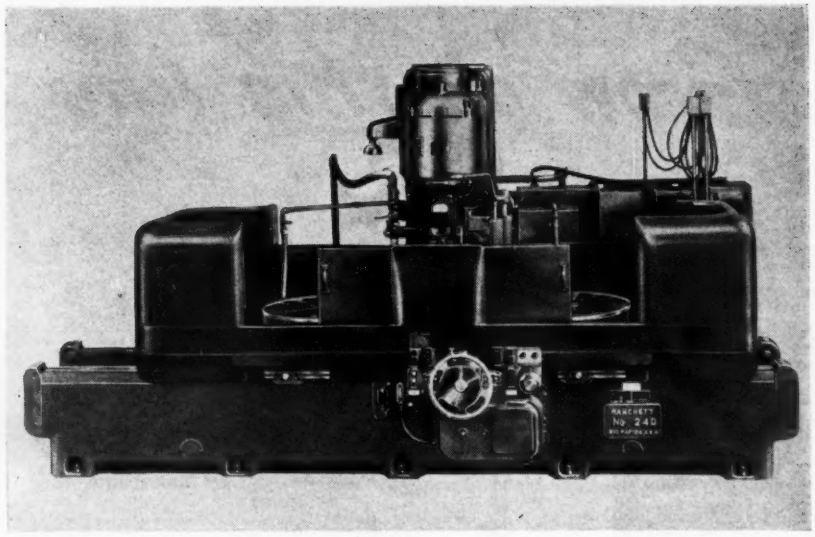
Write us on your shearing and forming problems. A complete Shear Catalog, No. S-4, and Brake Catalog, No. B-2, are available on request.

• *Photos: Courtesy of Trailmobile Co.*

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Hanchett Surface Grinder with Two Separately Controlled Rotary Work-tables

Hanchett Duplex Rotary Surface Grinder

The Hanchett Mfg. Co., Big Rapids, Mich., has developed a No. 24 duplex rotary surface grinder in which an electronic finger-tip control has been incorporated for separate operation of the two rotary work-tables or magnetic chucks. It is claimed that the double-table arrangement of this new machine practically eliminates idle or "down" time, and that it increases production without sacrificing accuracy or finish and without requiring additional man-power. Experience has shown that one operator can, in many cases, produce on this machine as much work as was previously turned out by two men operating single-table machines.

This machine is 9 by 15 feet, 7 1/2 feet in height, and weighs 24,000 pounds. The two direct-current motors attached to the under side of the carriage drive the rotary magnetic chucks at variable speeds under centralized push-button control. A 24-H.P., 900-R.P.M. motor of the built-in type drives the grinding wheel. Unusually fine finishes are said to be obtained with the new improved segmental type grinding wheel.

The equipment includes two 30-inch magnetic chucks, an 18-inch segmental wheel chuck fitted with a set of grinding segments, small motors and controls for head feed and carriage traverse, two drum type demagnetizing switches, an ammeter for the wheel motor, floodlight, wheel-dresser, and a wet grinding system, including two motor-driven coolant pumps and tanks. 86

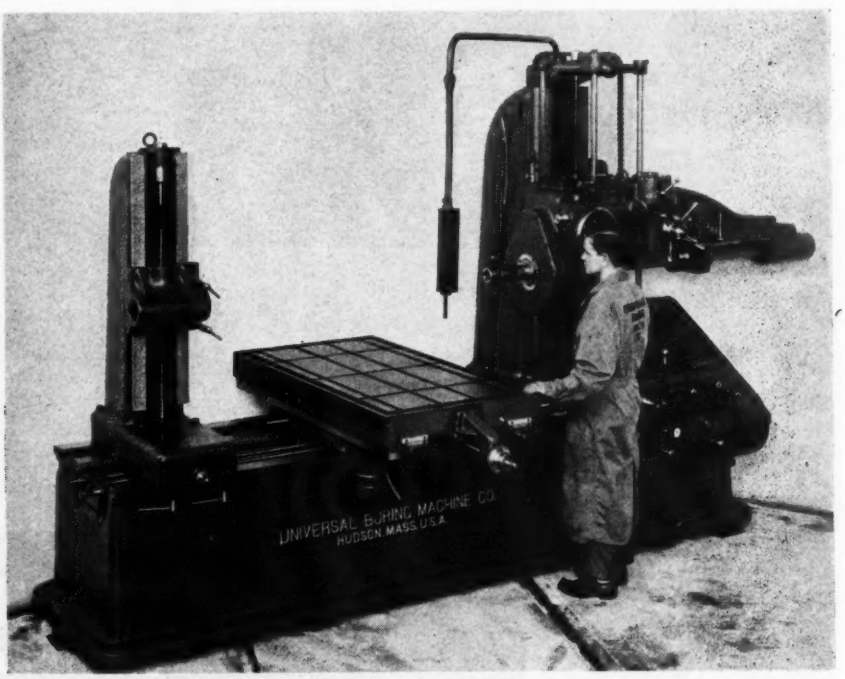
Universal Horizontal Boring Machine

The 3-inch horizontal boring machine built by the Universal Boring Machine Co., Hudson, Mass., has recently been redesigned and improved to increase accuracy and production capacity in performing milling, drilling, and boring operations. Improvements incorporated in this machine include higher speed ranges and an increase in the number of speeds available; the horsepower rating has also been increased. A pendent type control, which can be reached at almost any position around the machine, facilitates operation. 87

Improved Electrode for High-Tensile Steels

An improved shielded-arc electrode for welding grooved butt joints and horizontal or flat fillets in the higher tensile steels, such as A.S.T.M. A-212, has been announced by the Lincoln Electric Co., Cleveland 1, Ohio. Exhaustive field tests have shown that this electrode, known as Fleetweld 11-HD, will produce grooved butt joints of exceptionally good quality, free from porosity. Fillet welds made with this electrode are said to be extremely smooth, with a flat face. Low spatter loss, steady arc, and freedom from under-cut are characteristics claimed for this electrode.

Specimens of this weld metal have a tensile strength of 75,000 to 80,000 pounds per square inch, a yield strength of 59,000 to 62,000



Improved Horizontal Boring Machine Built by the Universal Boring Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 198.

SUPER IN PERFORMANCE

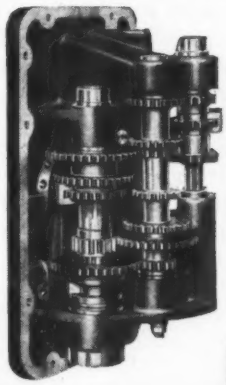
Outstanding performance under the pressure of war—now available to the uses of peace.

Cincinnati Bickford Super Service Radials will serve you well in competitive peace-time production.

The Air Preheater Corporation says: "Despite a round-the-clock schedule, a cost saving of 25% was effected by Cincinnati Bickford Super Service Radials."

Easy operation and steady performance were important factors here.

Write for detailed Bulletin R-24A



The eighteen feed changes are made through selective sliding gears controlled by two convenient levers. Every gear of the feed unit is of heat-treated alloy steel and every shaft is multiple splined. This construction stands out in marked contrast to the previously accepted spring dive-key feed mechanisms. A safety gear protects against overload.

Equal Efficiency of Every Unit Makes the Balanced Machine.

• *See our condensed Catalog in Sweet's File*

Photo: Courtesy of Air Preheater Corporation

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

pounds per square inch, and ductility of 19 to 23 per cent (elongation in 2 inches) as welded. When the stress is relieved at a temperature of 1200 degrees F., the tensile strength is 72,000 to 76,000 pounds per square inch, the yield strength 57,000 to 61,000 pounds per square inch, and the elongation from 25 to 30 per cent. The electrode can be used with either alternating or direct current. It conforms to American Welding Society's Specifications E-7020 and E-7030, and is available in 3/16- and 1/4-inch diameter sizes, 18 inches long.....88

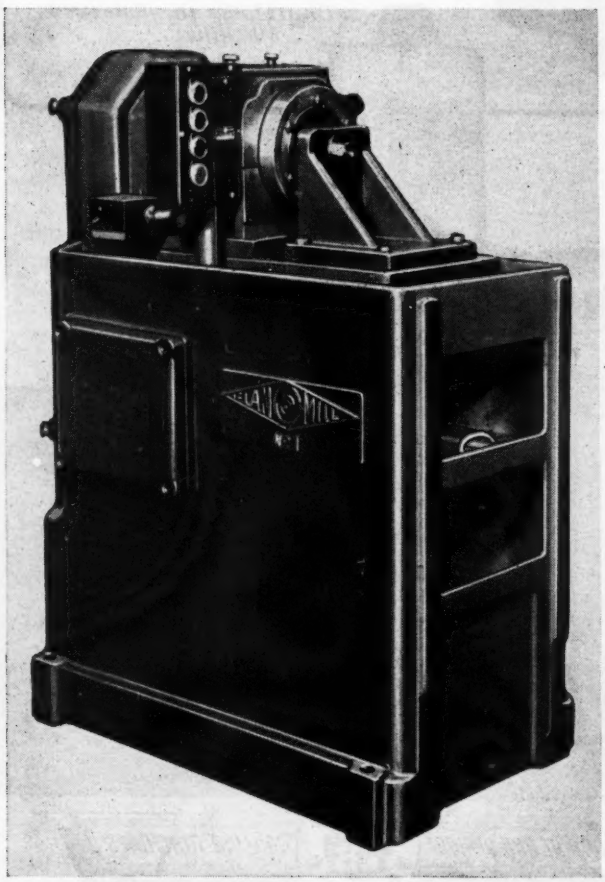
Plan-O-Mill Thread Milling Machine

The Plan-O-Mill Corporation, 1511 E. Eight Mile Road, Hazel Park, Mich., is manufacturing a new planetary milling machine designed especially for high-volume, low-cost thread milling and form milling. This new No. 1 Plan-O-Mill differs from previous models in size and in features designed to facilitate operation. Completely anti-friction construction is employed to combine thread milling accuracy with tapping speed. This machine is equipped with such earlier Plan-O-Mill features as push-button operation, coordination of speeds and feeds, and Thymo-trol electronic feed control designed for split-thousandth-inch control of the feed-in and feed-around movements.

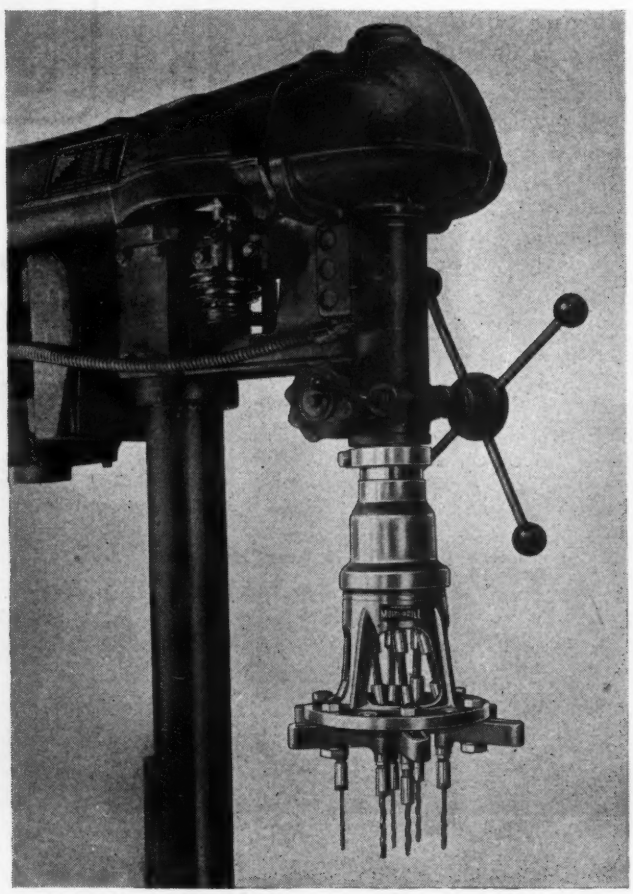
With this machine, a complete part can be milled in a single operation requiring as little as eight seconds. As the part does not move —the revolving cutter being fed around the work—large and cumbersome parts can be handled with a high degree of ease and speed. The machine has facilities for performing either external or internal threading, and will thread and mill parts up to 2 inches inside or outside diameter; through the use of an offset head it can be employed for larger work. The electronic control panel can be mounted on the floor, wall, or ceiling. 89

Commander "Multi-Drill" Attachment

The Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill., has developed a new six-spindle universally adjustable multi-spindle drilling attachment, which can be easily and quickly installed on most types of drill presses. It comprises a driving head with six movable spindles, each of which is located by an individual radially adjustable arm. This design permits the positioning of drills up to 17/64 inch in diameter in any arrangement or pattern desired, including a straight line, within a 5-inch diameter circle with a minimum distance between centers of 11/16 inch. Thus it is possible to drill from one to six holes simultaneously in one feeding stroke.

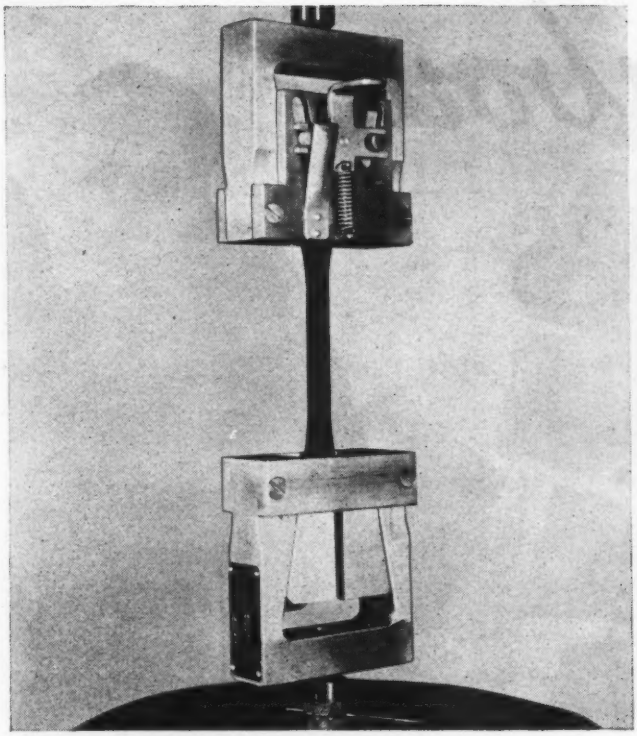


Thread Milling Machine Built by the Plan-O-Mill Corporation

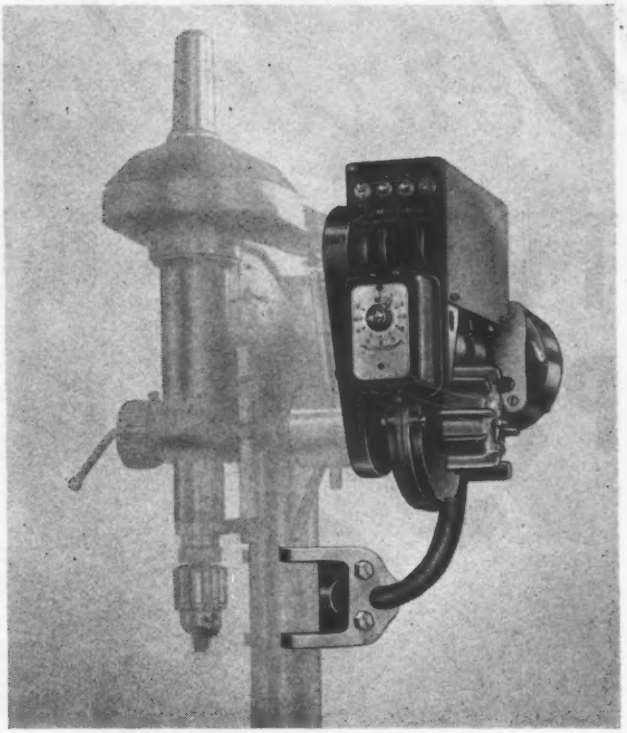


"Multi-Drill" Attachment Made by the Commander Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 198.



Grip for Testing Plastic Specimen



Knapp "Pre-Selectric" Power Feeder

The housing for the drive-gears of this attachment and the supporting frame and adapters are made of a special high-strength aluminum alloy. The entire attachment weighs only 13 pounds. Modifications of this attachment can be furnished to suit special applications. 90

Carbide-Tipped Core-Drills

Specially designed carbide-tipped core-drills intended for use in drilling hard, scaly cast iron are being supplied by the Tungsten Carbide Tool Co., 2661 Joy Road, Detroit 6, Mich. These core-drills are the result of a study of the effect of various carbide grades, tool shapes, shank materials, tool angles, number of flutes, etc., on the life of the tools. It is reported that in one application these tools drilled, between grinds, some 10,000 holes, 1 5/8 inches in diameter by 5/8 inch deep. This was equivalent to continuous production for seven days with two nine-hour shifts per day. In breakdown tests as many as 50,000 pieces per grind were obtained, although it is not recommended that the drills be run for that length of time without grinding. 91

Testing-Machine Grip Designed to Hold Plastic Specimens

The Baldwin Southwark Division of the Baldwin Locomotive Works, Philadelphia, Pa., has developed a special grip for plastic specimens designed on the Templin principle for use with the universal testing machine. This new grip of 5000 pounds capacity weighs only 4 1/4 pounds, and is made to meet the increased demand for equipment designed especially for testing plastics and similar materials. It is self-aligning, swiveling, laterally adjustable, and insures a good grip on the glassy-hard surfaces of certain plastics.

Another new development of this company is a wedge grip with a replaceable file-toothed face for use in testing machines having capacities up to 300,000 pounds. This feature eliminates the necessity for replacing an entire grip when the teeth become worn or broken. It is available in a flat type for tension testing of flat specimens, and in a V-type for testing round specimens. The general construction is the same as that of the conventional grip, except that it is slotted to permit the insertion of the file-toothed face. 92

Knapp "Pre-Selectric" Power Feeder for Deep-Hole Drilling

The "Pre-Selectric" power feeder shown in the accompanying illustration has been brought out by the James H. Knapp Co., 4921 Loma Vista Ave., Los Angeles 11, Calif., to automatically duplicate the feeding movements employed by a skilled mechanic when deep-drilling or tapping small holes by providing for the automatic clearing of chips at preselected depths. The power feeder is applied to the drill press by means of a bracket fastened to the column and by a collet attached to the feed-shaft of the drill press spindle. With this arrangement, the feeder can be installed by one man in less than ten minutes.

Positioning of the power feeder is not critical, being governed by the alignment of the collet with the spindle feed-shaft. The weight of the unit is balanced on its supporting arm, no weight being added to the drill press spindle feed-shaft bearings. It is claimed that this feeder will consistently drill No. 50 holes through alloy-steel plate to the full length of the drill without drill breakage and with less dulling of the drill than

To obtain additional information on equipment described on this page, see lower part of page 198.

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EX-CELL-O for PRECISION

EX-CELL-O's *facilities:*

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

HEAT TREAT

Induction Heating
Laboratory for Heat Treat Control Including Micro Examination and Photography
Atmosphere Control Continuous Hardening Furnaces
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Gas Carburize Furnaces
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PRODUCTION MACHINES

Multiple Vertical Turret Lathes
Multiple Spindle Automatic Screw Machines
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Hand Screw Machines
Centerless Grinders
Single and Multiple Spindle Drilling Equipment
Plain O.D. Grinders
Plain I.D. Grinders
Milling Machines
Broaching Machines
Precision Thread Grinders
Precision Boring Machines
Lapping Machines
Special High Production Equipment

UNIT ASSEMBLIES

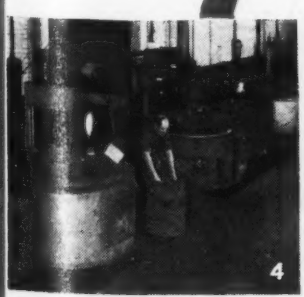
For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.

To left: **If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision, speed and economy in production, send your name, company, address and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.**

Illustrations below: **A few miscellaneous views of some Ex-Cell-O heat treat facilities, considered among the most modern and complete in American Industry.**


4


5

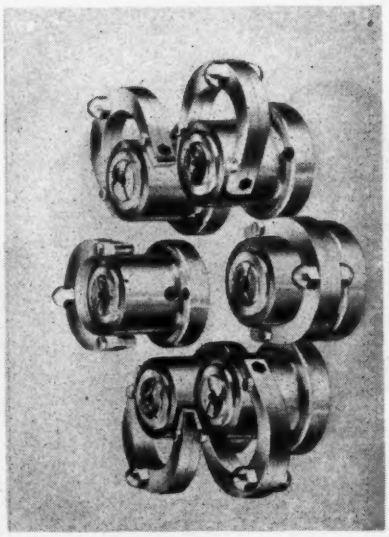
DETROIT 6, MICH.

when the feed is controlled by hand. The unit operates on 110-volt single-phase or 220- to 440-volt three-phase current. ——93

Special Fixture for Threading Fuse Adapters on Landmaco Machine

The special work-holding fixture shown mounted on the Landmaco threading machine in the accompanying illustration has been developed by the Landis Machine Co., Waynesboro, Pa., for use in threading fuse adapters. This fixture is especially designed to meet the close tolerance requirements for concentricity between the thread of the adapter which screws into the nose end of the shell and the bore of the adapter.

The fixture arbor supports the adapter on its bore, centering it on the conical counterbore machined to provide a seat for the fuse. A pin at the base of the pilot, which engages one of the wrench notches, prevents the work from turning on the arbor. A C-washer dropped over a seat near the end of the arbor serves to secure the work in place for the threading operation when a lever at the rear of the fixture is rotated to draw the work against the conical seating surface. The fixture unit is so designed that it can be easily applied to the standard machine carriage. Provision is made for both horizontal and vertical adjustment to obtain accurate alignment of the work-holding arbor of the fixture with the machine spindle. 94



Group of Six Zagar Collets in Circular Formation as Used on Indexing Table

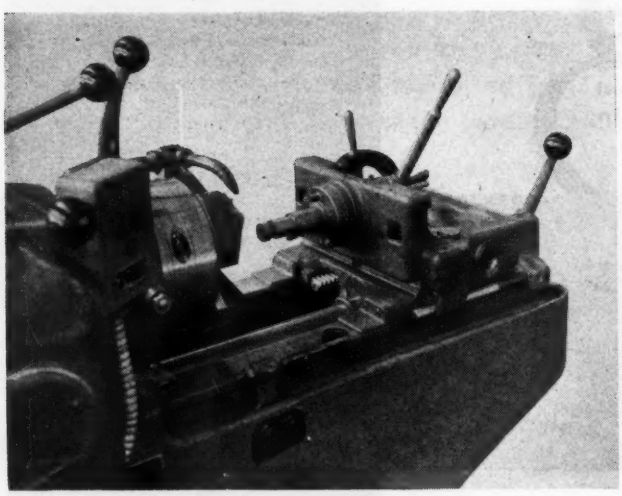
Zagar Collet for Indexing Table Type Machine Tools

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, has brought out a new collet holding fixture having an over-all height from bottom of mounting base to top of collet of 3 inches. This new collet is especially designed to permit mounting in groups on the table of a multiple-spindle chucking machine. Six of these collet fixtures arranged in a circle, as shown in the accompanying illustration, for example, can be mounted on a table which rotates one-sixth of a revolution at each cycle. With this arrangement, the fixtures remain stationary while the tools are performing the machining operations. When the table on which the collets are mounted indexes, the collets are opened and then closed automatically at the loading position.

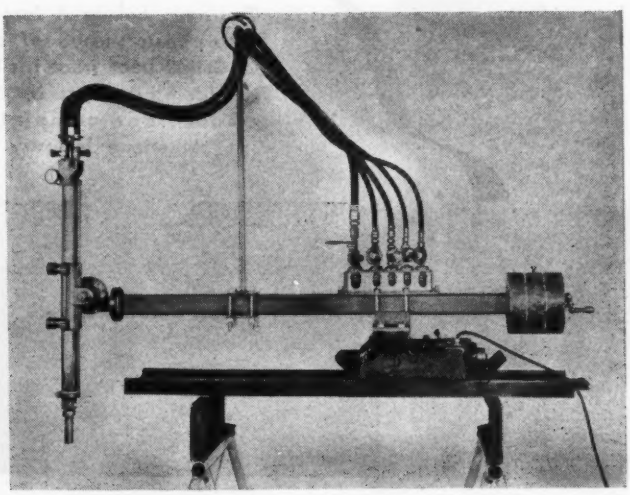
A section 2 1/4 inches in diameter by 1/2 inch long extending beneath the mounting surface, or the largest portion of the fixture, serves as the locating boss for positioning the fixture on the indexing table. The horseshoe type of operating handle shown in the illustration is furnished as standard with a hardened boss on each side to permit automatic operation by means of cams. Other types of handles, such as required for hand operation, can also be provided. —— 95

Heavy-Duty Machine-Cutting Blowpipe

A new heavy-duty, oxy-acetylene, machine-cutting blowpipe—the Oxweld C-45—has been developed by The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. This blowpipe will cut steel from 16 to 50 inches thick, and is particularly suited for hot top cutting, ingot slitting, riser cutting, cutting of large forgings, and scrap cutting in a wide range of applications for which the oxygen lance was formerly required. It is water-cooled, and is intended to be mounted on a heavy-duty, straight-line cutting machine, such as the new Oxweld CM-37 or CM-21 machine. A 50-pound gage is



Landmaco Equipped with Special Fixture for Threading Fuse Adapters



Heavy-duty Machine-cutting Blowpipe Developed by The Linde Air Products Company

To obtain additional information on equipment described on this page, see lower part of page 198.

Whatever your needs in Power Transmission call FOOTE BROS.

• The growth of American Industry is directly attributable to the development of power and to the methods of transmitting that power.

Since 1859, Foote Bros. has specialized in power transmission. Over the years, this company has met the needs of industry for gears and speed reducers in a wide range of sizes and ratios.

Not satisfied with just keeping step with industry, Foote Bros. engineers looked forward to new horizons in power transmission. By 1940 a revolutionary type of gear, closely approaching theoretical perfection, was already in production. These new Aircraft Quality gears produced by the millions, aided in the building of America's dominant air power.

As a further step in solving power transmission problems, engineers at Foote Bros. developed compact power units that have played an important part in improving the operation of aircraft and that are now being designed for many general industrial applications.

Two technical bulletins—one on Aircraft Quality Gears, and one on Power Units—have recently been issued by Foote Bros. Copies will be sent to you upon request.

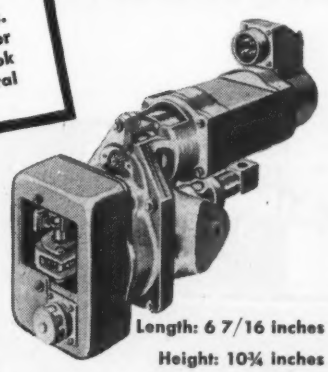
FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. P, 5225 South Western Boulevard • Chicago 9, Illinois

COMMERCIAL GEARS

Diameter: 17½ feet

For commercial applications, Foote Bros. can produce giants 20 feet in diameter or midgets that you can hold in one hand. Look to Foote Bros. for spur, helical, worm, spiral or bevel gears to meet your needs.

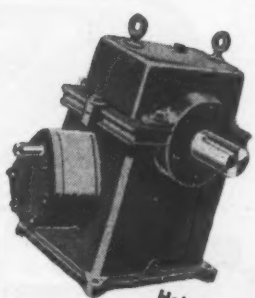
POWER UNITS



Length: 6 7/16 inches
Height: 10¾ inches

Compact power units, self-contained with electric motors, driven by flexible shafts or directly coupled to the power source, are now being developed to meet a wide variety of industrial requirements. Write for Bulletin.

SPEED REDUCERS



Heights: 10¾ to 58¼ inches

Foote Bros. speed reducers are made in a wide range of sizes and gear ratios to meet practically every industrial need. See your Foote Bros. representative or write for information concerning your needs.

AIRCRAFT QUALITY GEARS

Diameter: 5.795 inches
Length: 11.36 inches
Diameter: 8.6087 inches

A-Q (Aircraft Quality) gears closely approach theoretical perfection. They assure you greater mechanical efficiency, lighter weight, less noise and permit operation at higher speeds.

FOOTE BROS.
Better Power Transmission Through Better Gears

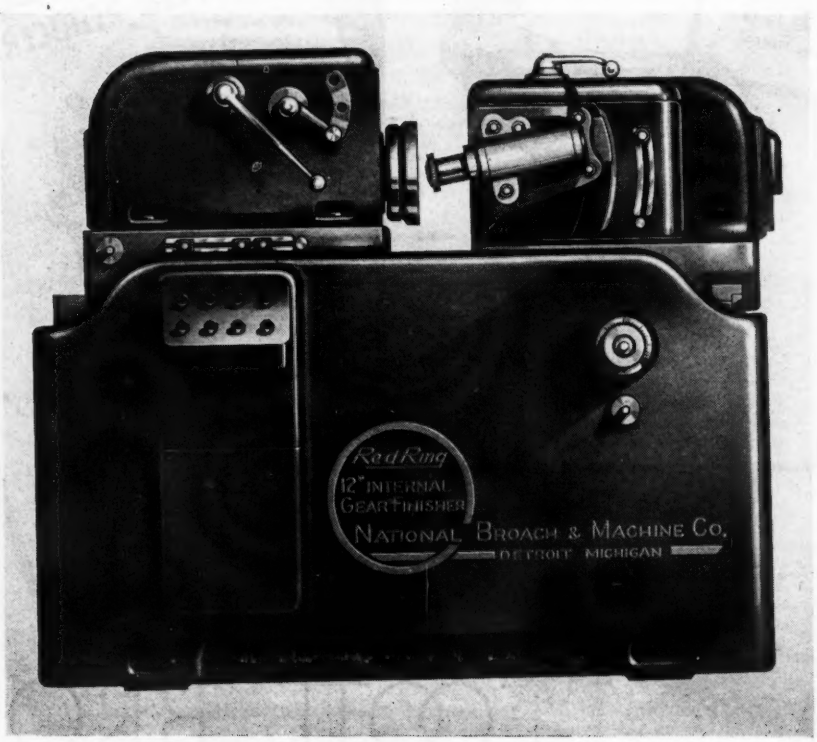
attached to the blowpipe body for checking cutting oxygen pressures, which are usually low—never exceeding 35 pounds per square inch.

This blowpipe is designed for use with medium-pressure acetylene, and will operate satisfactorily on a generator or a manifold having a minimum hourly capacity of 500 cubic feet of acetylene. An Oxweld C-45 blowpipe-holder, designed especially for use with this blowpipe, is also available. This holder is designed to insure accuracy and stability in making vertical and angular adjustments, angular adjustment in the plane of cut being 135 degrees. 96

Red Ring Internal Gear-Shaving Machine

In response to the increasing demand for an internal gear-shaver for gears used in automatic transmissions, speed reducers, home appliances, and similar mechanisms, the National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich., has developed a new Red Ring internal gear-shaving machine designed to produce gears having a superior finish and a high degree of accuracy. With this machine, compensation for distortion and other errors in hardened gears can be made in the shaving process, which, in many cases, will eliminate the need for finish-grinding or lapping. When lapping is necessary, the shaving operation serves to reduce to a minimum the amount of stock to be removed by lapping.

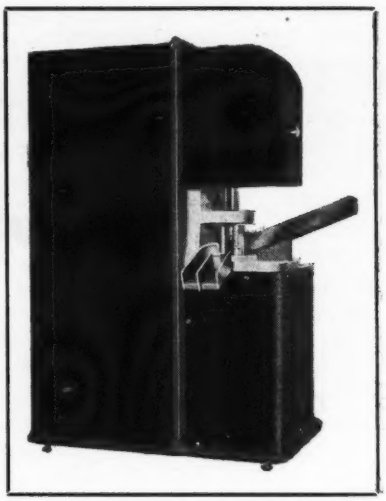
This machine operates on the crossed-axis gear-shaving principle, and has a simplified fast loading feature and semi-automatic clamping and ejection mechanisms which make possible high production with unskilled labor. Floor-to-floor time, for example, is seventy seconds for shaving the teeth of a gear 6 inches in diameter having a face width of 1 inch. Only fifteen to thirty minutes is required for a change of set-up. The automatic feeds can be easily set, and the power traverse of the cutter-head slide can be quickly adjusted to clear the work-spindle for loading and unloading. 97



Red Ring Internal Gear-shaving Machine

Automatic Inspection Machine

It is possible to gage the depths of holes, using either end of the piece as a reference point; the position of shoulders within holes; projections from the bottom of holes; and the outside length of pieces or outside diameters on an automatic electronic gaging instrument originally developed by the Autotron Co., P.O. Box 722, Danville, Ill., for gaging the length of the firing pins in ordnance fuses.



Automatic Inspection Machine Developed by Autotron Co.

The instrument is adapted for automatically gaging to close tolerances a wide variety of small parts manufactured from metal, plastic, glass, or paper. It will inspect more than 3300 pieces per hour, the speed depending upon the size and shape of the part and the manner in which it can be handled. In some cases, parts can be fed by hopper into a loading chute, from which the machine automatically feeds the pieces into the inspection position. According to the makers, it is possible to accurately gage dimensions with tolerances of 0.0001 inch. 98

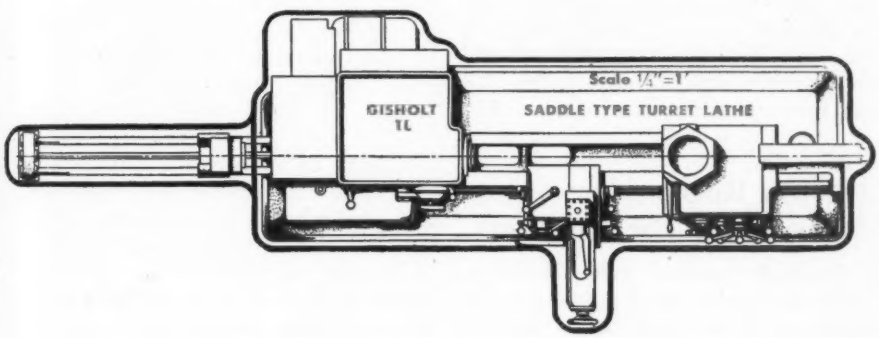
Michigan Abrasive Lapping Compound

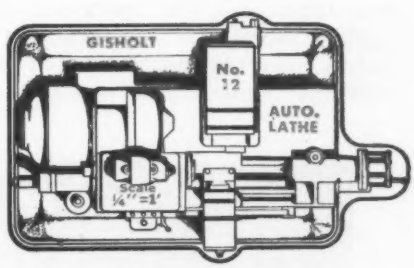
A line of lapping compounds for either hand or machine lapping has been brought out by the Michigan Abrasive Co., 1117 Bellevue Ave., Detroit 7, Mich. These compounds are supplied in a range sufficient to make available a compound fitted to any job being lapped. Thirteen standard types are provided, ranging from No. 50 to No. 600, in the regular silicon-carbide oil-mix line. Special compounds are also available. 99

To obtain additional information on equipment described on this page, see lower part of page 198.

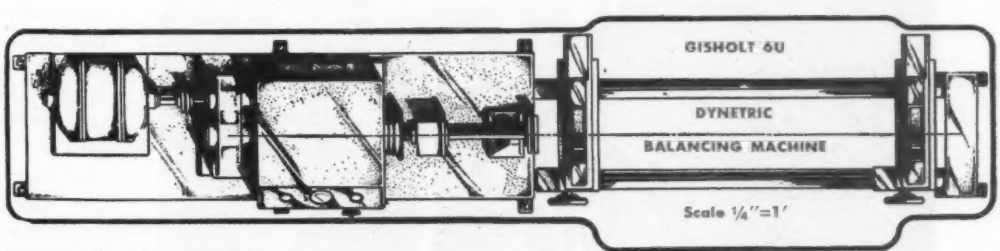
PLANNING NEW PLANT LAYOUTS FOR TOMORROW?

Gisholt is ready to assist with cardboard punchings for each size and type of Gisholt machine. These models—each made to exact scale—enable you to plan the location, or re-location, of machines by simply placing them upon your projected factory floor layout sheets to obtain the most efficient arrangement of machines, more easily. They are available, free of charge, upon request, to all companies preparing for reconversion to peacetime production. Use the coupon below.





The three diagrammatic cut-outs shown here represent the Gisholt 1L Saddle Type Turret Lathe, the No. 12 Hydraulic Automatic Lathe, and the 6U Dynetric Balancing Machine. Made precisely to ¼ inch to 1 foot scale, they eliminate the need for special trips to the shop to obtain accurate measurements of actual machines, or tedious checking of catalog specifications. Similar cut-outs are now available on all sizes and types of Gisholt machines.



USE THIS HANDY COUPON

to request models desired

Be sure to indicate the quantity required for each size and type of machine. All requests should be directed to Madison.

GISHOLT

TURRET LATHES

AUTOMATIC LATHES

BALANCING MACHINES

SPECIAL MACHINES

GISHOLT MACHINE COMPANY

1209 East Washington Ave. • Madison 3, Wisconsin

Look Ahead—Keep Ahead—With Gisholt Improvements in Metal Turning

Gisholt Machine Company
1209 East Washington Ave.
Madison 3, Wisconsin

Gentlemen:

Please send me, free of charge, diagrammatic cut-outs of Gisholt Machines as indicated below. (Please state number required for each.)

__ No. 3 Ram Type Turret Lathe	__ Simplimatic (Automatic) Lathe
__ No 4 Ram Type Turret Lathe	__ No. 12 Hydraulic Automatic Lathe
__ No. 5 Ram Type Turret Lathe	__ 1S Dynetric Balancing Machine
__ 1L Saddle Type Turret Lathe	__ 3S Dynetr c Balancing Machine
__ 2L Saddle Type Turret Lathe	__ 3U Dynetric Balancing Machine
__ 3L Saddle Type Turret Lathe	__ 4½U Dynetric Balancing Machine
__ 4L Saddle Type Turret Lathe	__ 6U Dynetric Balancing Machine
__ 5L Saddle Type Turret Lathe	__ Dynetric Micro-Balancer

Firm Name.....

Street Address.....

City..... *State*.....

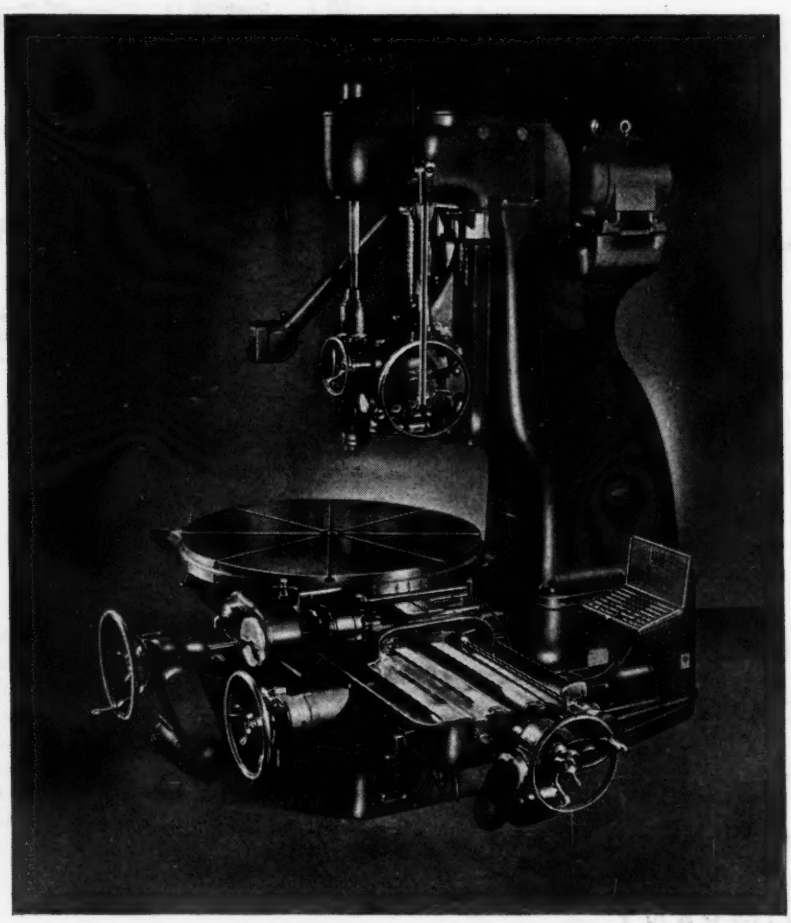
By..... *Title*.....

Pratt & Whitney Jig Borer Equipped with Large Built-In Rotary Table

A non-detachable, built-in, precision rotary table available in two sizes—42 and 48 inches in diameter—which permits precision boring of large work to either polar or rectangular coordinates, or both, has recently been added to the No. 3B jig borer built by the Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. This new built-in rotary table replaces the plain rectangular table previously employed, and can be used for certain precision milling, as well as boring, operations.

The rotary table is equipped with a precision worm indexing mechanism designed to provide excellent accuracy for average work. For work requiring a higher degree of accuracy, a special system can be provided in the outer rim. Power is furnished for indexing the table and for operating the regular horizontal and transverse power traverse movements on the machine slides. Binding devices are provided for locking the table while work is being bored.

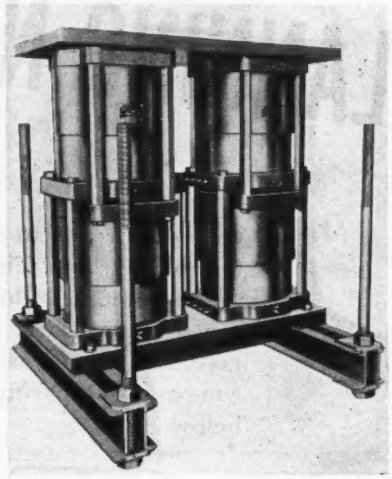
Either of the large rotary tables will enable holes to be bored on a diameter of 53 1/2 inches. The largest outside work diameter that will clear the column ways is 71 inches. If the work will fit into the gap below the column ways (less than 14 1/8 inches above the table), the maximum outside work diameter can be increased to 89 inches. The standard distance from the table top to the spindle nose is 24 1/8 inches. Both this and the gap distance can be increased by using rising blocks under the machine column. 100



Pratt & Whitney Jig Borer with Rotary Table

Dayton Rogers Heavy-Duty Pneumatic Die Cushions

Multiple tandem type Model 2-CC extra heavy duty pneumatic die cushions have just been brought out by the Dayton Rogers Mfg. Co., 2835 Twelfth Ave. S. Minneapolis 7, Minn. These die cushions have cylinder sizes ranging from 6 to 24 inches, with capacities for producing a draw-ring holding pressure of from 6 to 100 tons. The hardened and ground pin pressure pad is made to fit a given press bed opening, and is held in parallel working alignment by the tandem cylinder type construction, which compensates for all off-center loading.



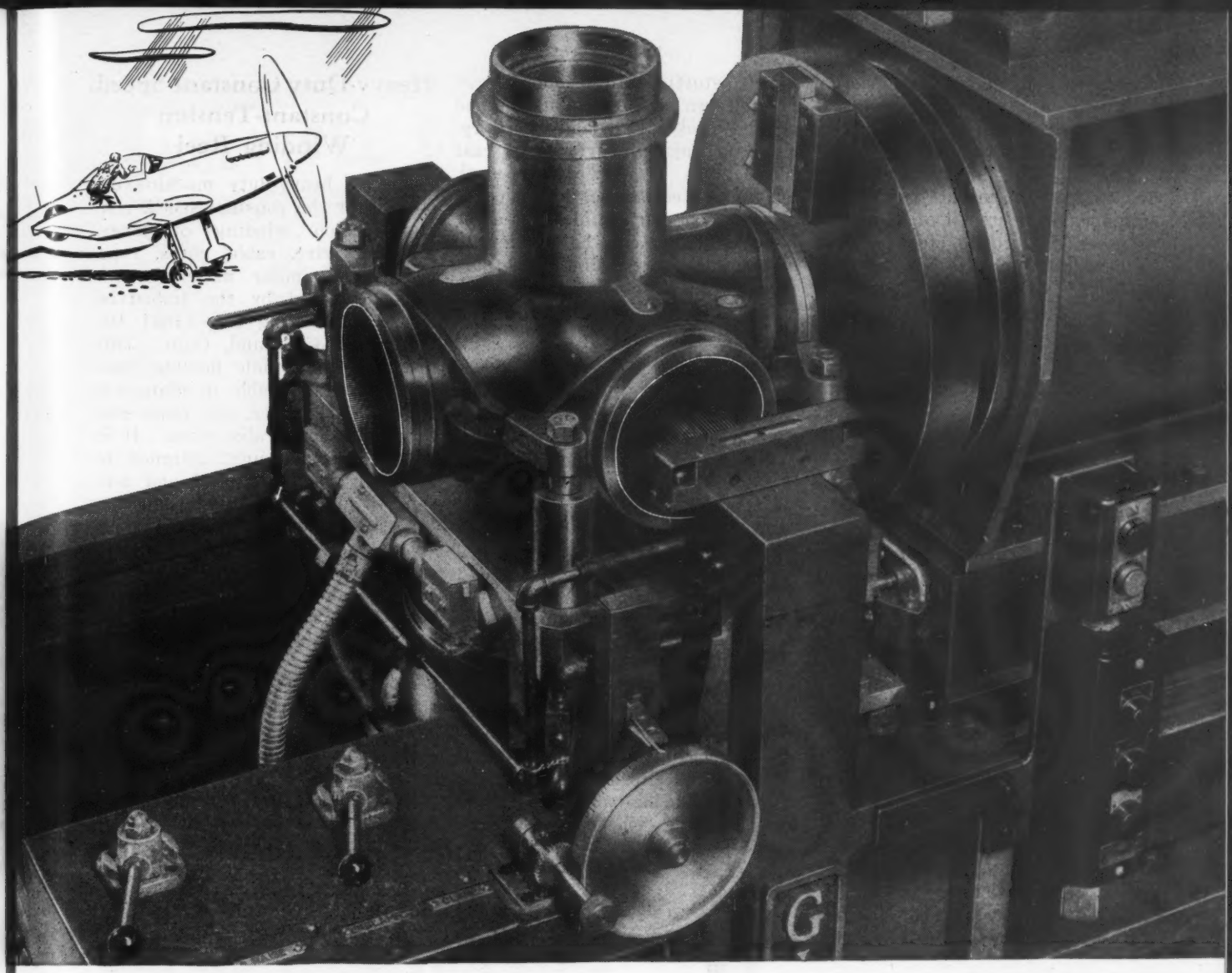
Dayton Rogers Die Cushions Designed for Heavy Duty

The adjustable supporting structure is so designed that the four suspension rods furnished with the cushions can be attached to the press-bed lugs at any given spacing. The centralized lubricating header block makes it possible to readily lubricate all cushion cylinders regularly from the side of the press. These pneumatic die cushions are particularly adaptable to large straight-side presses where maximum ring-holding pressure in proportion to the total over-all press tonnage is required. 101

Equipment for Marking Tools and Metal Parts

Improved etching equipment designed to engrave steel parts or tools with legible, permanent typewritten names, numbers, instructions, or other data has been placed on the market by Nagle Brothers, Chicago Heights, Ill. This electrochemical marking equipment consists of a small metal case containing a rectifier power kit which operates on 110-volt, single-phase, alternating current; a roller type

To obtain additional information on equipment described on this page, see lower part of page 198.

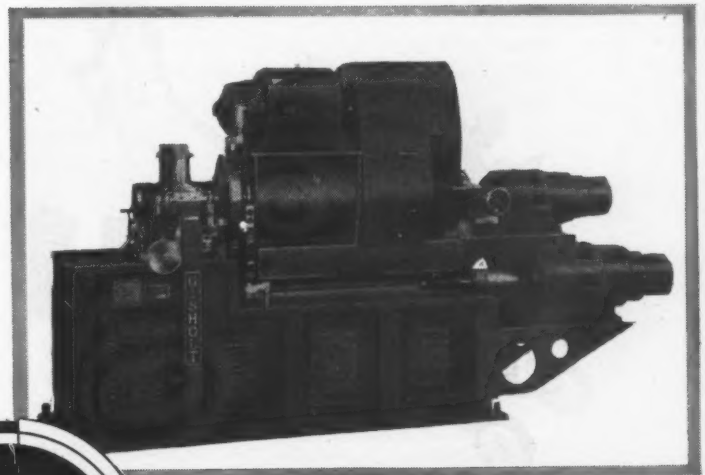


THE *New Way* TO BALANCE PROPELLER HUBS

Now, the unbalance in aircraft propeller hubs is *located, measured* and *corrected* in one series of operations—without removing the workpiece from the machine.

Incorporated with a Gisholt Static Balancing Machine is a special clamping fixture, hydraulically operated, which holds the workpiece while a rotating tool (seen at right) turns a groove in the barrel portion of the hub, removing the exact amount of metal necessary to obtain accurate balance.

The efficiency of this set-up has turned a difficult balancing problem into a routine production job. It is typical of the way Gisholt engineers are solving a great many problems with Gisholt balancing equipment adapted to the specific requirements of the job. If you have a problem in static or dynamic balancing, bring it to Gisholt.



GISHOLT STATIC BALANCING MACHINES

On these machines, the indicated amount of unbalance is converted into correction to be applied by setting the hand wheel at the right. Pushing a start button then causes the cutting tool to rotate and to be fed in so as to remove the unbalance—correction removal is quick, easy and accurate. The workpiece is removed from the machine perfectly balanced. Complete information on Gisholt static and dynamic balancing machines is available on request.

GISHOLT MACHINE COMPANY

1209 East Washington Ave. • Madison 3, Wis.

Look Ahead . . . Keep Ahead

. . . with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

electrode pad; connecting cords, tips, and clip; a stencil paper and conditioner; and the necessary electrolytic chemicals.

Etching can be completed in about one-half minute with this equipment. A stencil of the name or other data to be etched is cut on a typewriter. No heat is generated by this process, and there is no distortion of the etched part or any sign of burr. This method can be used with equally good results on finished surfaces of cast iron, high- or low-carbon steel, alloy tool steels either hardened or annealed, or on stainless steel or aluminum. It can be applied to either flat or cylindrical surfaces. ---------- 102

Barrett Portable Lathe

A portable lathe for turning brake-drums, designed for field service or for use wherever time and labor can be conserved by bringing the lathe directly to the job, has been brought out by the Barrett Equipment Co., 21st and Cass Ave., St. Louis 6, Mo. This equipment is especially useful where fixed-base or machine-shop service facilities are not available. Although designed primarily for automotive use, the lathe can be used to advantage in many industrial plants for internal machining, grinding, and honing operations.

The outer end of the lathe shaft rests on an adjustable steadyrest or outward support which prevents off-center deflection of the shaft when it is required to support heavy work. The lathe and its adjustable stand, together with the steadyrest, are mounted on a well balanced truck to permit easy handling. When the lathe is in position for use, the 6-inch rubber-tired wheels are raised from the floor, so that the truck provides a firm support; thus the floor and truck arrangement, and not the lathe shaft, serve to support the weight.

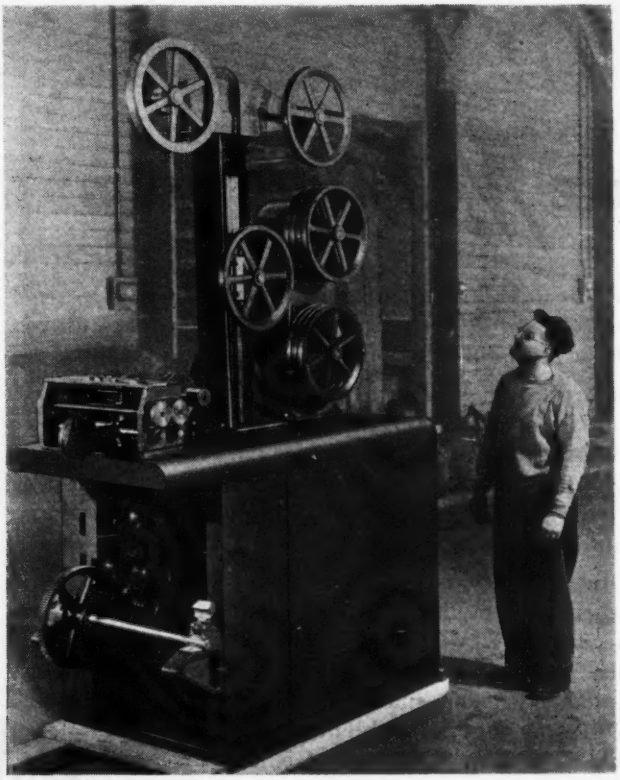
The lathe is built on the principle of the internal boring-bar, and has a swing of from 7 to 24 inches. It is equipped with rheostat speed control for operation on any 110-volt alternating or direct current, and has adequate power for handling the largest and heaviest brake-drums. ---------- 103

Heavy-Duty Constant-Speed, Constant-Tension Winding Reel

A new heavy-duty machine designed for the constant-speed, constant-tension winding of large-diameter wire, cable, cores, rope, hose, and similar materials has been developed by the Industrial Oven Engineering Co., 11621 Detroit Ave., Cleveland, Ohio. This machine will handle flexible insulated wire and cable in diameters up to 1 1/2 inches, and other materials in comparable sizes. It is a self-contained unit designed to maintain constant speed and tension within a variable production range, being motor driven and requiring no outside source of power or synchronization devices.

The standard speed ranges are 25 to 150, 40 to 200, and 60 to 240 feet per minute, and the tension values range from 5 to 1000 pounds. This machine was originally built for use in drawing wire and cable through an automatic saturating and lacquering system, and is supplied either as part of such a system or as an individual unit. The standard model of the large machine employs a 42-inch

Portable Brake-drum Lathe Brought out by the Barrett Equipment Co.



Self-contained Winding Reel Developed by the Industrial Oven Engineering Co.

To obtain additional information on equipment described on this page, see lower part of page 198.

MULTIPLE CUTS ON TOUGH S.A.E. 4140 STEEL

SUNICUT 209...

More parts produced with accuracy and fine finish

Here's a case-history that proves the importance of the right cutting oil! A plant had to produce vital parts quickly. With the aid of Sunicut 209, the transparent sulphurized cutting oil, they were able to turn out their quota of parts rapidly, with extremely close tolerances and fine finish.

Type of Machine: New Britain-Gridley Automatic Screw-Machine, 2" Capacity, No. 61, Six Spindles.
Metal:.... S.A.E. 4140 Bar-Stock.
Operation: Forming, drilling, tapping, and threading.
Speed:... 85 SFPM
Feed:..... .005".
Lubricant: Sunicut 209

Some manufacturers of this part were unable to perform the difficult tapping-operation all on one machine. A secondary operation was necessary, which resulted in the loss of production-time. Use of Sunicut 209 permitted all operations on one machine. Production was speeded up and fine-quality threads produced. Rejects were practically eliminated.

Sunicut 209 is a free-flowing, transparent, correctly balanced sulphur, lard, and mineral oil combination. It is the right combination to BETTER machine-tool output. For actual proof of what Sunicut can do for you, test it in your own shop under your own operating-conditions!

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

SUNOCO **SUN INDUSTRIAL PRODUCTS**
OILS FOR AMERICAN INDUSTRY

reel, but a special size taking a 60-inch reel can be supplied. Special units can be equipped with jack type casters to facilitate moving about the plant. 104

Diamond Dressing Device for Multi-Ribbed Thread Grinding Wheels

A semi-automatic diamond dresser for multi-ribbed thread grinding wheels which can be mounted between the centers of a single-point thread grinding machine and is actuated by the driving pin on the faceplate, has been brought out by the Sheffield Corporation, Box 893, Dayton 1, Ohio. A precision ground cam for the required pitch is mounted on an accurately ground and lapped spindle to control the movement of a suitable dressing diamond. The reciprocating movement of the diamond, in conjunction with the uniform lateral motion imparted by the lead-screw, results in dressing the wheel to the required multi-ribbed profile.

This dresser makes it possible to convert many single-point thread grinders for multi-ribbed thread grinding. It is recommended for use on work demanding long lengths of thread and in cases where the breakdown of a single-point wheel would necessitate taking a number of cuts; for thread gage grinding to eliminate thick first and last threads; for maintenance of minimum lead variation; for all fine-pitch threads over 32 threads per inch; wherever the wheel is to be dressed at the required helix angle; and where it is desired to traverse grind work having sharp corners and small radii.

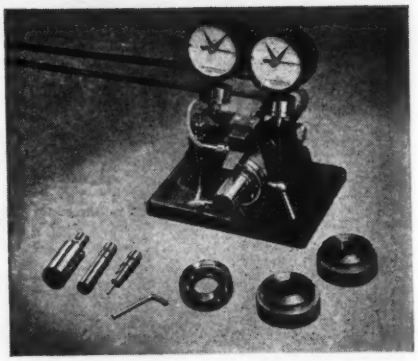
The dresser makes possible the use of a multi-form wheel on single-point thread grinders having sufficient table space to permit its installation, a clearance of at least 2 1/2 inches being required below the centers and 5 1/4 inches back of the centers. The minimum center-to-center distance requirement is 4 3/4 inches. 105

Moore Pneumatic Comparator Gage

The Moore Products Co., H and Lycoming Sts., Philadelphia 24, Pa., has announced the addition of an air gage to its line of gaging equipment. This new gage is designed for the simultaneous inspection of inside and outside diameters, and has an adjustable feature which permits it to be used on a wide range of sizes.

The model illustrated will accommodate work with bores as small as 0.150 inch and outside diameters of 5/8 inch up to 3 3/8 inches. The illustration shows the gage set up for inspecting a 35-millimeter ball-bearing race having an outside diameter of 72 millimeters to a tolerance of 0.0003 inch. Maximum and minimum master rings for this size bearing and interchangeable plugs for gaging three smaller inside diameters are shown in the foreground.

The adjustable jaws which measure the outside diameter and the interchangeable plugs for the inside diameter measurements are both equipped with pneumatic gaging nozzles which do not touch the work being gaged. A cam lock serves to fix the pneumatic plug in the correct position and provide a leakproof air connection. 106

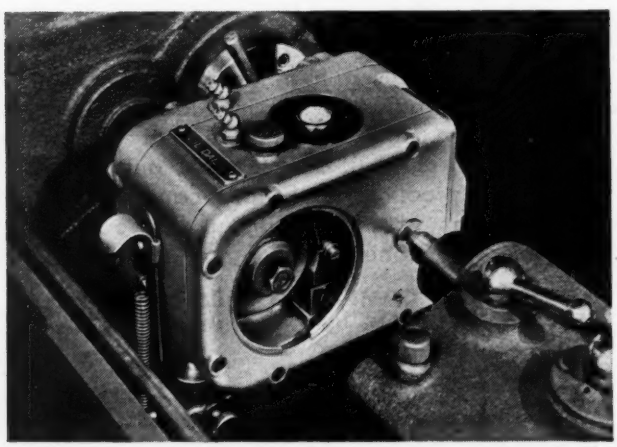


Pneumatic Comparator Gage Made by Moore Products Co.

Tap-Cartridges for Blind-Hole Tapping

The difficulties created by chips in cutting internal threads by taps, especially in tapping blind holes, are well known. A means for eliminating these difficulties has been developed by Tap-Cartridge, Inc., 514 First National Bank Bldg., Cincinnati 2, Ohio. By this means, the chips are removed as rapidly as they are formed until the tap has almost reached the bottom depth required; the remainder of the chips in the flutes of the tap are removed when it is withdrawn.

This is accomplished by a patented method known as "cartridge-



Device for Dressing Multi-ribbed Thread Grinding Wheels, Made by the Sheffield Corporation

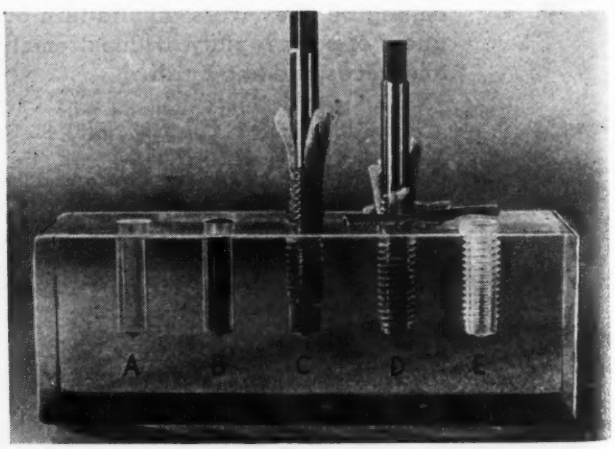


Illustration Showing the Tapping of a Blind Hole Performed by the Aid of a Tap-cartridge

To obtain additional information on equipment described on this page, see lower part of page 198.

They travel HALFWAY AROUND THE GLOBE to attend this "school"!

When the urgent call for defense—then war—production sounded throughout the nation, industry faced the huge task of swiftly training millions of "green" workers from all walks of life.

Carboloy Company—to fulfill its part in this tremendous undertaking—quickly expanded its long-established facilities for basic training—in fundamentals of carbide tool use and maintenance; immediately enlarged its training course quarters at Detroit.

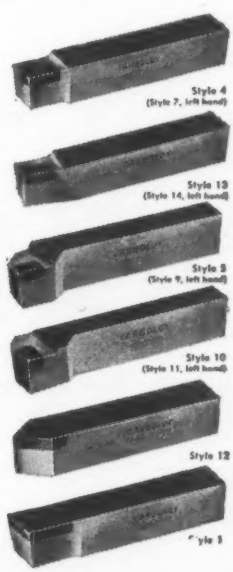
Since Pearl Harbor, industry and government have sent to this "school" supervisory personnel from 38 states and many Allied countries—including even far-off Australia—halfway round the globe! Each man receives six days of intensive training covering actual shop work, practical "lecture" sessions, and discussion-reviews of Carboloy Training Films. He returns equipped to quickly pass this training along to supervisors and operators in his own plant. By this procedure, more than 2500 key men in plants engaged in vital war work have been prepared to meet their carbide training needs swiftly and efficiently.

An Important Aid for Peacetime Production

So valuable is this Training Course in effecting reduced machining costs and increased production through a proven method of centralized control on carbide use in each plant, that for years it has been a permanent part of Carboloy service. Plants reconverting to civilian manufacture are invited to enroll their key supervisors in this free course. It was a proven aid to war production—and will be sound preparation for the highly competitive postwar era.

Send for descriptive booklet—GT-155.

Effective training in carbide use, plus availability of low cost standard Carboloy Tools such as these, has played a vital role in war—and will help plants prepare for the competitive postwar era.



CARBOLOY COMPANY, INC.
11147 EAST EIGHT MILE AVE., DETROIT
Sole makers of Carboloy Cemented Carbides

CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MILWAUKEE • NEWARK
PHILADELPHIA • PITTSBURGH • THOMASTON

Carboloy Products are also sold by leading Mill Supply Distributors

Booklet on Request

CARBOLOY (TRADE MARK) CEMENTED CARBIDES *Service*

tapping." A hard plastic, loosely fitting insert, known as a "tap-cartridge," is placed in the blind drilled hole, after which tapping proceeds with a regular tap in the usual manner.

As seen in the illustration, *A* is the drilled hole; *B* shows a tap-cartridge of the right size dropped into the hole; and *C* shows the tapping under way, illustrating how the tap-cartridge picks up all the chips as they are formed and forces them to flow with the cartridge material up and out of the hole. At *D* is shown the tap near the bottom of the hole; all chips except those from the last few threads have been forced out; the last chips are in that portion of the tap-cartridge which is still in the flutes of the tap and are withdrawn with the tap without damage to the thread. *E* shows the tapping operation completed without chip wedging or galling. 107

Landex Improved Die-Head

The Landis Machine Co., Waynesboro, Pa., has just brought out an improved hardened and ground die-head for use on automatic and semi-automatic screw machines. This new Type LL Landex head supersedes the Type L head, and has several features developed to assure more dependable service and the production of threads of greater accuracy.

A major improvement in this new head consists of the use of latch blocks in place of the previously employed locking ring. The latch-block abutments can be easily reground when they have become worn in service. The latch blocks are positioned in the adjusting ring, which is a decided advantage in that the abutments come in contact with the back face of the closing ring in latching the head in the closed position. As the die-head is adjustable for different diameters, the latch blocks are continually located in a different position on the abutting surface of the closing ring, with the result that wear of any appreciable amount is extended over a considerable period of time. This head is now available in 5/8- and 7/8-inch sizes. 108

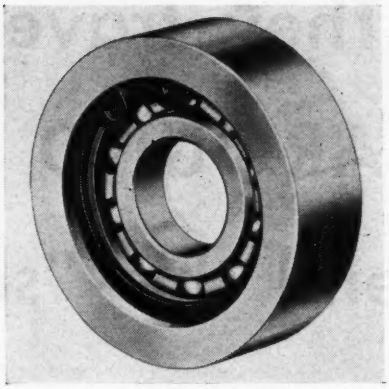


Fig. 1. "Truarc" Internal Retaining Ring Used to Form Ball-bearing Shoulder in Housing

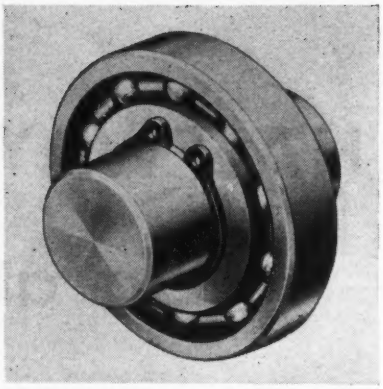


Fig. 2. "Truarc" External Type Retaining Ring Used as Ball-bearing Shoulder on Shaft

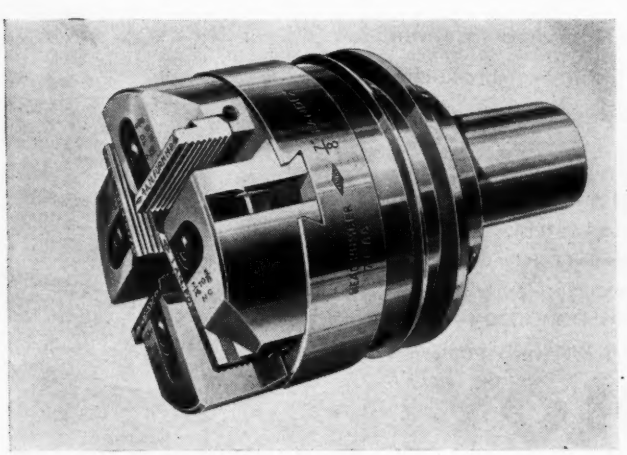
Waldes "Truarc" Retaining Rings

"Truarc" retaining rings developed by Waldes Kohinoor, Inc., Long Island City 1, N. Y., to provide an improved means for locking or positioning moving parts such as shafts, gears, bushings, or bearings are available in a wide range of sizes in the internal type shown in Fig. 1 for fitting into grooved housings, and in the external type, Fig. 2, for fitting around grooved shafts or rings.

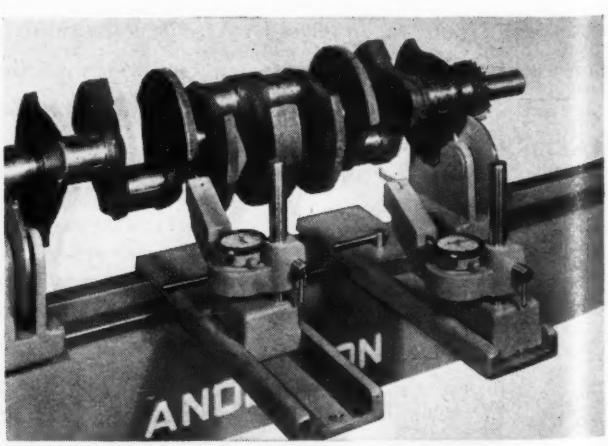
These retaining rings are designed to save weight, space, and machining costs, and to simplify assembling and disassembling operations. The eccentricity of the outer and inner diameters serves to insure a close circular fit, and the apertures in their free ends permit quick insertion or removal by means of expanding or contracting pliers. 109

Anderson "Roto-Checker" for Crankshafts

For speeding up the checking of crankshaft bearings, Anderson Bros. Mfg. Co., 1907 Kishwaukee St., Rockford, Ill., has developed



Landex Die-head for Use on Automatic and Semi-automatic Screw Machines



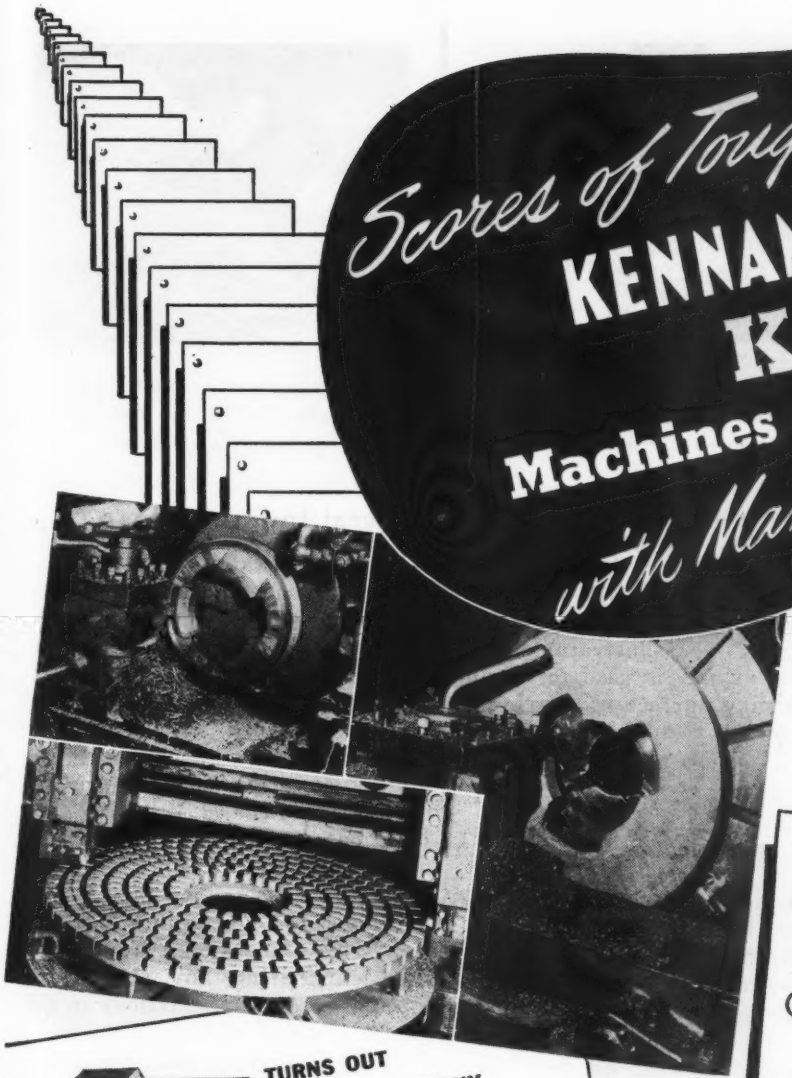
Anderson Special "Roto-Checker" Developed for Checking Crankshafts

To obtain additional information on equipment described on this page, see lower part of page 198.

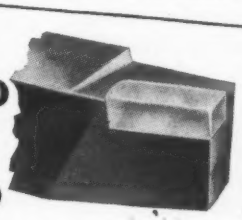
Scores of Tough Jobs Prove

KENNAMETAL K6 Machines CAST IRON

with Maximum Economy

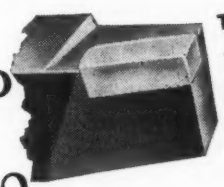


Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.



REMOVES TONS OF METAL FROM CHILLED CAST IRON PARTS, AT TOOL COST OF 74¢ PER TON

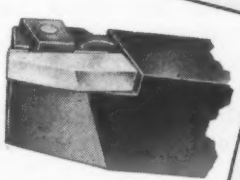
Style 12 Tool with K6 tip turns 1½ lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 21½" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375". Depth of cut —⅛". SFM-120.



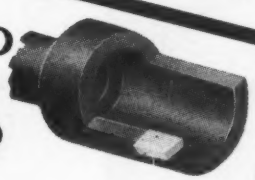
TURNS OUT 10 TIMES AS MANY PIECES, ON ROUGH CASTING, BETWEEN REGRINDS

One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inferior grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation—turning outside diameter and facing both sides of hub and rim. Feed —.032" Depth of cut 1/16" to 3/8" SFM-280.

MULTIPLIES OUTPUT, ON FACING OPERATION, ON SANDY IRON CASTING



Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing sandy iron castings. Feed—.036". Depth of cut—⅛" to 3/16" SFM-150 at start, 320 after tool entered cut.



CUTS 35 PIECES (on Abrasive Electric Iron) AS AGAINST 3 FOR CARBIDE PREVIOUSLY USED

This unique tool, tipped with Kennametal K6, turns out 11½ times as much work between grinds as the carbide tool previously used. Operation—finish trepanning cut on electric iron part. Feed—.003". SFM-210. Accurate tolerances and good finish required, and produced.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and overall costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this *new* and *improved* tungsten carbide—Kennametal Grade K6.

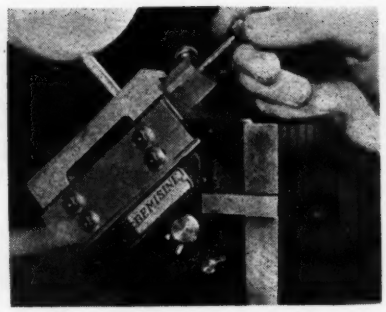
KENNAMETAL

SUPERIOR CEMENTED CARBIDES

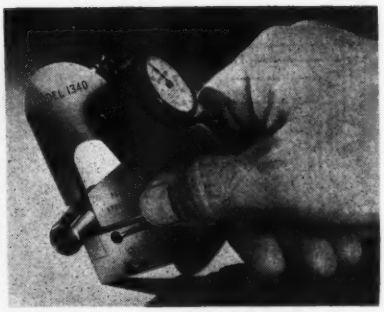
TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL *Inc.*, LATROBE, PA.

the special "Roto-Checker" shown in the accompanying illustration. The crankshaft is simply placed on the four rotating disks of the checker, after which the required number of indicators is brought into position for checking the bearings as the crankshaft is revolved. One indicator can be furnished for each bearing. The four disks of the checker roll on accurate supersensitive ball bearings. The bases are made in two lengths—42 and 64 inches. "Roto-Checkers" of larger size can also be made for special work. 110



Bemisine Angle Dresser Placed on the Market by the Nichols-Morris Corporation



Visual Indicator Snap Gage Brought Out by the Federal Products Corporation

Bemisine Dual-Purpose Angle Dresser

A device for the precision dressing of grinding wheel faces to specified angles has been announced by the Nichols-Morris Corporation, 50 Church St., New York 7, N. Y. This device consists of a precision-fitted sliding member carrying a diamond dressing tool mounted on an adjustable sine-angle plate which can be located on the magnetic chuck directly below the grinding wheel, as shown in the illustration. The sine-bar principle is used in tilting the sine plate to the desired angle, an ordinary 2-inch micrometer being the only measuring instrument required to set the device for dressing any angle from 0 to 90 degrees within accuracy limits of one minute of arc.

After the setting has been made, the diamond tool is brought into contact with the wheel, and the slide is moved back and forth manually to generate the corresponding angle on the wheel. When not required for angle dressing, the sliding attachment can be quickly removed from the sine-angle plate, leaving the working surface free for holding small parts at accurately set angles for grinding, milling, or jig boring operations. The illustration shows how the dresser is used for truing the forming surface of a grinding wheel to the required angle. 111

Bay State Diamond Hand Hones

Two new pocket-size vitrified diamond hand hones have been announced to the trade by the Bay State Abrasive Products Co., Westboro, Mass. These hones are especially adapted for touching up carbide tools as soon as they show signs of becoming dull, so that they can be kept in efficient operation and their useful life prolonged. Both models are available with a diamond section 7/16 inch wide by 1 1/2 inches long by 1/16 inch deep. Both are supplied with plastic handles, and furnished in a handy leather pocket case. One model has a hone at both ends, while the other has a hone at only one end. 112

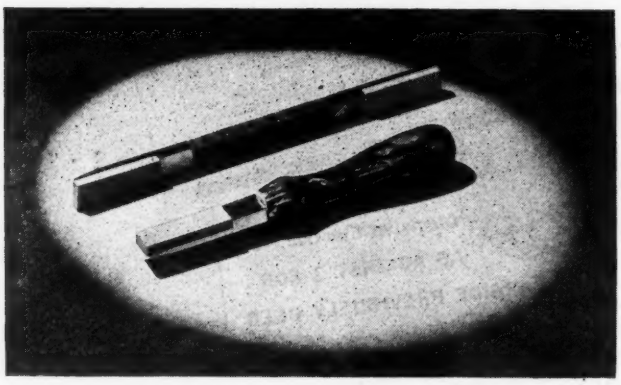
Federal Indicator Snap Gage

A new indicator snap gage designed to have all the simplicity, compactness, and utility of the conventional type snap gage, together with the advantage that it positively indicates any variation in the specified dimension and definitely indicates how much the dimension varies, has been brought out by the Federal Products Corporation, 1144 Eddy St., Providence 1, R. I.

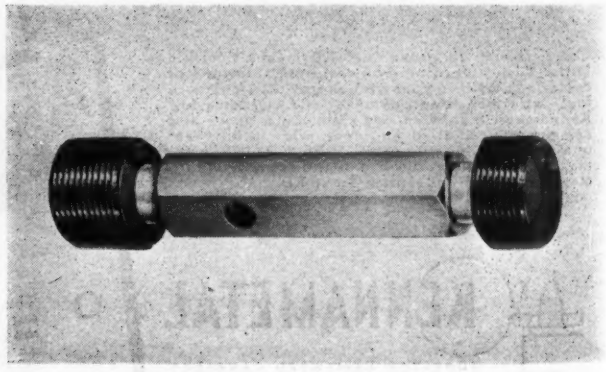
This visual type snap gage, known as Model 1340, magnifies mechanically all dimensional variations, thus eliminating any chance for inaccuracy due to variations in the touch, or sense of feel, of the user. This single-purpose gage has a dial graduated to 0.0001 inch; it has a range of 0.008 inch, and can be used for checking any dimension between 1/8 and 1 1/2 inches. The weight of the complete gage is only about 7 ounces. 113

Tantung Thread Plug Gages

Thread plug gages developed to give longer service are now being manufactured from Tantung by the



Bay State Pocket-size Vitrified Diamond Hand Hones



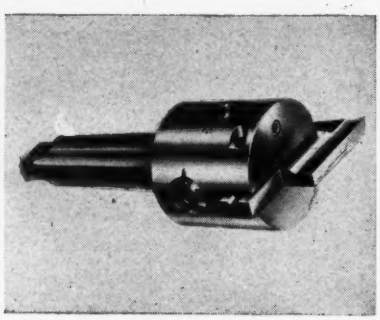
Thread Plug Gage of Tantung Made by Master Gauge Co.

To obtain additional information on equipment described on this page, see lower part of page 198.

Master Gauge Co., 2222 Fenkell Ave., Detroit 21, Mich. Tantung, from which these gages are made, is a hard, strong, and tough nonferrous alloy containing cobalt, tungsten, chromium, and tantalum-columbium carbide, which imparts a self-lubricating action that greatly increases wear resistance. The dense, fine-grained Tantung takes a high finish, is non-magnetic, and is not corroded by moisture or any of the common acids or fumes. 114

Boring Tool Designed to Eliminate Chatter

The Behr Products Co., Warren, Mich., has developed an improved boring-bar designed to eliminate chatter and increase production. This new tool is available in two standard sizes having head diameters of 2 and 3 1/2 inches. It can



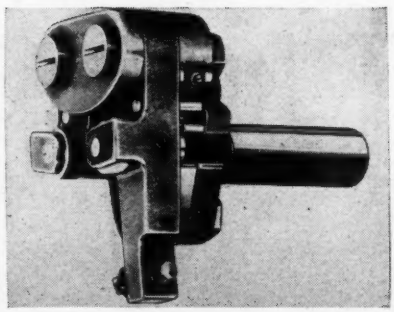
Behr Improved Boring-bar

be used on vertical or horizontal lathes, screw machines, and all types of precision boring machines.

The boring-bar is of heavy construction and is provided with precision micromatic blade adjustment. The boring blades are available in a full range of sizes in either tungsten-carbide tipped or faced styles or in high-speed steel. The blades can be quickly interchanged. Regular blades are made in sizes for precision boring or facing work from 1 3/4 to 12 1/2 inches in diameter. A small tool adapter permits boring holes down to 1/4 inch in diameter. 115

Boyar-Schultz Knurling Tool

A Model K knurling tool has recently been added to the line of screw machine tools made by the



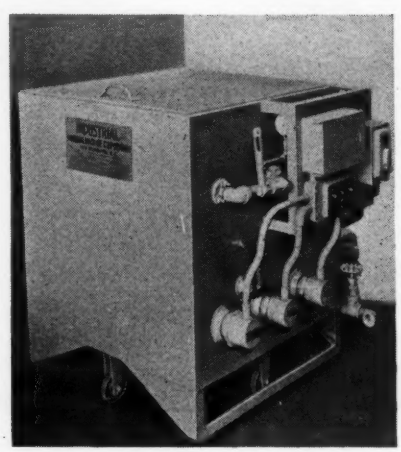
Boyar-Schultz Knurling Tool for Screw Machines

Boyar-Schultz Corporation, Walnut St. at Hoyne, Chicago 12, Ill. This tool is operated from the screw machine turret, feed and pressure being applied simultaneously to both sides of the work through the application of a cantilever action.

The knurling rolls of this tool are fed to exactly the same depth at equal pressure to avoid transverse strains and "springing" of the spindle. This feature is especially advantageous when knurling long parts. One of the outstanding features of this tool is its adaptability for knurling between and behind shoulders. It is made in three sizes—the OOK handling work up to 3/8 inch in diameter, the OK having a range from 3/16 to 5/8 inch, and the 2K handling pieces from 1/4 to 7/8 inch in diameter. 116

Portable Industrial Washing Machine

A Model C.B.H. portable industrial washing machine for use in cleaning stampings, ball bearings, castings, etc., which consists of a tank and housing with electric immersion heaters, a pump and motor, valves, gages, etc., has been brought out by the Industrial Washing Machine Corporation, New Brunswick, N. J.



Portable Washing Machine

Parts to be cleaned in this machine are placed in a square mesh basket, 16 by 16 inches. The cover of the machine is then lowered and a spray valve opened. The force of the spray rotates the basket, causing all the material to be completely cleaned. If desired, the basket can be removed to permit the tank to be used for wax- or oil-dipping of parts. The machine is 3 by 3 1/2 feet, and weighs 300 pounds. 117

Pneumatic Hammer Made by Superior Mfg. Co.

Small Pneumatic Hammer

A small, powerful, pneumatic hammer delivering about 13,000 blows per minute and operating on less than 2 cubic feet of air at 80 to 100 pounds per square inch pressure is being released for general distribution by the Superior Mfg. Co., Public Square Bldg., Cleveland 13, Ohio. This hammer was originally designed for special war work where an exceptionally small tool with plenty of power and long-lasting qualities was demanded. It weighs less than 2 pounds, and is known as the "Bantam Bully." The valve control located in the pistol trigger position provides easy control.

Tools for this hammer, of which a wide variety are available, are held in a quick-acting ball-and-channel locking chuck. The hammer piston has a travel of approximately 3/8 inch, and is normally operated at between 12,000 and 14,000 blows per minute. It can be used for all kinds of cold chisel-

To obtain additional information on equipment described on this page, see lower part of page 198.

Convenience and Rigidity FEATURE THIS APRON UNIT

SIDNEY *Precision* LATHES

● The cross feed and compound screws are furnished with adjustable nuts and tapered gibs to compensate for backlash and wear. Both are equipped with large micrometer dials and provided with ball thrust bearings.

A micrometer stop on the cross feed provides an adjustable depth stop for turning or threading—and for internal and external thread chasing.

The swivel of the compound rest is graduated 90° each way from center and is securely held in place by four bolts. Note center gib provided in addition to front and rear gibs under Vee ways. All of these points of design and construction make for convenience and rigidity of operation.

The SIDNEY MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY . OHIO
ESTABLISHED 1904

ing of metals, peening, welding flash stripping, light scaling, riveting, forming and finishing, routing, etc. 118

Under-Water Oxygen Cutting Equipment

The Chicago Tool & Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill., has developed equipment, arranged in a compact set, for use in cutting steel under water in salvage and construction work. The new equipment is known as the arc-oxygen under-water cutting torch. A special tubular steel electrode has been developed for use with this torch. 119

* * *

Export Trade Requires Imports

In considering the great opportunities for export trade after the war, several factors should be considered. First, an extensive export trade is not desirable until the needs of our own country have been filled, both as regards production machinery and consumer goods. To maintain employment in the long run, however, exports are necessary to many of our industries; but when we recognize this fact, we must also recognize that it is not possible to have an active export trade unless there are also imports. We must not look upon imports as something that deprives American workers of a job. On the contrary, these imports must be paid for by exports, and the manufacture of the exported goods means jobs for American labor. One-track minds usually can see only one side of this picture. It is very necessary that American industrial and labor leaders alike should see both.

* * *

We face a more fundamental and important test than that of winning the war. Internal forces as dangerous as any foreign aggressor threaten the country's future. These internal forces will surely destroy the nation unless we can find renewed unity and again learn to cooperate effectively among ourselves.—*Louis Ruthenburg*

Government Surplus Should be Placed on the Market Quickly

In the most recent issue of *Trundle Talks*, published by the Trundle Engineering Co., Cleveland, Ohio, attention is called to the importance of placing government surplus products on the market immediately, so that the needs of the public, as well as of industry, may be met before industry is ready to supply goods for peacetime distribution.

In this booklet George T. Trundle, Jr., says: "We can gain a substantial share of re-employment before manufacturing concerns have completed their conversion programs if we can get distribution, selling, servicing, and miscellaneous activities moving again. For example, people want blankets, shoes, and soap; the Government has these products. Retailers want goods for their shelves; the Government has them in stock. Wholesalers want materials and supplies; the Government has them available as surplus. Manufacturers want machinery and buildings; the Government has these too.

If the Government today pushes the disposal of surpluses, the effect upon our domestic economy from the standpoint of jobs will be the same as that produced by rapid conversion. For instance, when a truck goes to market, it takes somebody to sell it, someone to drive it, someone to repair it, and someone to provide it with gasoline and oil. Four jobs are directly connected with that truck. Today the truck manufacturers have no trucks ready to sell—but the Government has.

You can multiply that illustration a thousandfold. The Government has left over from the war billions of dollars worth of every kind of supplies and equipment useful to individuals and to industry. Every time any one of these items starts to move to the market, somebody has to go to work to help in distribution, maintenance, etc.

Some of the Peaceful Gains from the Atomic Bomb Research

At a meeting recently called by the M. W. Kellogg Co., chemical engineers of Jersey City, N. J., it was pointed out that the peaceful industries will gain considerably from the research conducted in connection with the atomic bomb. Among some of the industries that will benefit by this research were mentioned petroleum refining, chemical and processing industries, the manufacture of pressure and vacuum vessels, high-vacuum industries, gas processing industries, the electrical and refrigeration industries, and industries employing corrosive chemicals.

Among the specific products and methods in which improvements may be expected as a result of the research that has been conducted, were mentioned pumps, heat exchangers, spectroscopes, the checking of welds, the pretesting of vessels for leaks before being placed in operation, new methods of detecting high degrees of vacuum, low-pressure low-temperature dehydration of foods, the separation of helium and hydrogen from process gases, new electronic techniques in high vacuum, improved handling of fluorides for refrigerants, new pump and valve lubricants and packing methods, new treatment of metal surfaces to prevent corrosion, and completely enclosed pumps operated from the exterior by induction.

It was also predicted that a great number of new industrial products will be introduced as a result of the atomic bomb research.

* * *

Ellwood Improved Cutting Electrode—Correction

A description in September MACHINERY, page 222, of an improved electrode made by the Ellwood Products Corporation, Ellwood City, Pa., for cutting metals at greatly increased speed and for use under water, erroneously stated that "any unskilled workman can successfully cut metal with this electrode after only ten months' instruction." Obviously, this should have read "after only ten minutes' instruction."

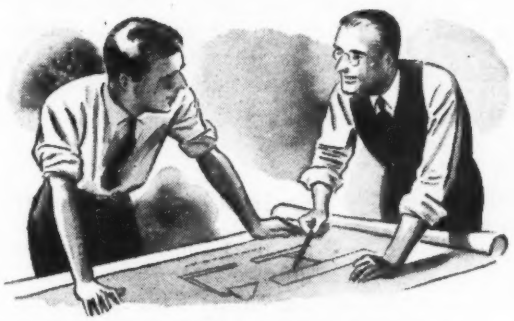
To obtain additional information on equipment described on this page, see lower part of page 198.

DAMAGE EXPELLER!

While using slotted screws, work-spoiling driver skids were causing frequent damage to plastic shades in the assembly of desk lamps. Refinishing slowed down production, and spoilage boosted costs . . . until the manufacturer started using Phillips Recessed Head Screws.

OUTPUT IMPELLER!

With the change to Phillips Screws, damage and delays were eliminated. And with no more worry about driver skids, power drivers could be used, speeding output further. Costs came tumbling down . . . production set new records.



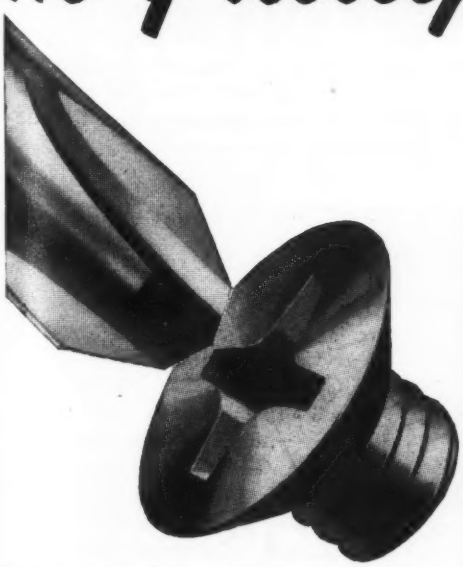
PROBLEM DISPELLER!

Phillips Recessed Head Screws, engineered to take heavier driving pressures, simplify product design, give it more strength, more rigidity . . . often with the use of fewer screws. Screw-driving is faster, easier, surer . . . permits design innovations slotted screws just can't touch.

SALES PROPELLER!

The Phillips Recessed Head radiates quality. It's trimmer . . . smarter looking . . . modern as tomorrow. No unsightly burrs and uneven appearance to cool off interested prospects. Put the extra sales push of Phillips Screws behind your product . . . make *good* merchandise look *better!*

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

High Production with Carbide Nib Molds

The production records that have been achieved by sintered-carbide cutting tools and dies can now be obtained by sectional carbide nib molds for powder metallurgy, according to an announcement by the Firth-Sterling Steel Co., McKeesport, Pa. This company has experimented for six years with this branch of powder metallurgy. It is stated that the sectional carbide nib molds have produced, per grind, from seven to ten times the number of "compresses" that it is possible to produce in steel molds, and that they have equalled or surpassed the production in solid carbide nib molds. These sectional molds can also be recut, the production, after each recutting, being equal to that of the original mold. The Carbide Die & Mold Co., Pittsburgh, Pa., manufactures nibs and molds.

A specific case may be of interest. In a plant engaged in pressing tungsten-silver electrical contacts, the tool-steel molds originally used were operated in connection with hydraulic presses exerting a pressure of 40 tons per square inch. This set-up did not prove wholly satisfactory, and the molds had to be discarded after 12,000 or fewer "compresses." It was decided to shift to sectional carbide nibs and carbide-tipped plungers. With this change, the pressure was increased to 60 tons per square inch, and finally to 70 tons.

After 27,000 "compresses" had been made with the new set-up, the copper brazing holding the carbide tip to the steel plunger failed. A solid carbide plunger was substituted, which was made a shrink fit in the steel shank. With this change, the mold continued in service from 27,000 to 124,000 units, at which time the mold was examined and was found to have worn less than 0.001 inch. The plunger was redressed, 0.008 inch being removed from its head. It is expected that the mold will now be good for 500,000 "compresses" before recutting is necessary. Five recuts are estimated to be practicable, which forecasts a production of 2,500,000 units from the complete life of the mold. Regular operating tests run in other plants indicate that a production of 500,000 pieces per cut is easily obtained. In some cases, ten or twelve recuts seem to be practicable.

Teeth of Rack Flame-Cut to Shape

By using an oxy-acetylene shape-cutting machine, a midwestern steel plant recently saved more than 50 per cent of the cost of racks, as well as considerable time. The plant found it necessary to replace a number of cinder car racks 5 feet long, 4 inches wide, and 2 1/4 inches thick. These racks are used when the car is being tipped to discharge its molten slag. The original racks were cast. To avoid the high cost and delay involved in making a pattern for the replacement, it was decided to flame-cut the rack from a 5-inch thick steel slab with an Oxweld shape-cutting machine.

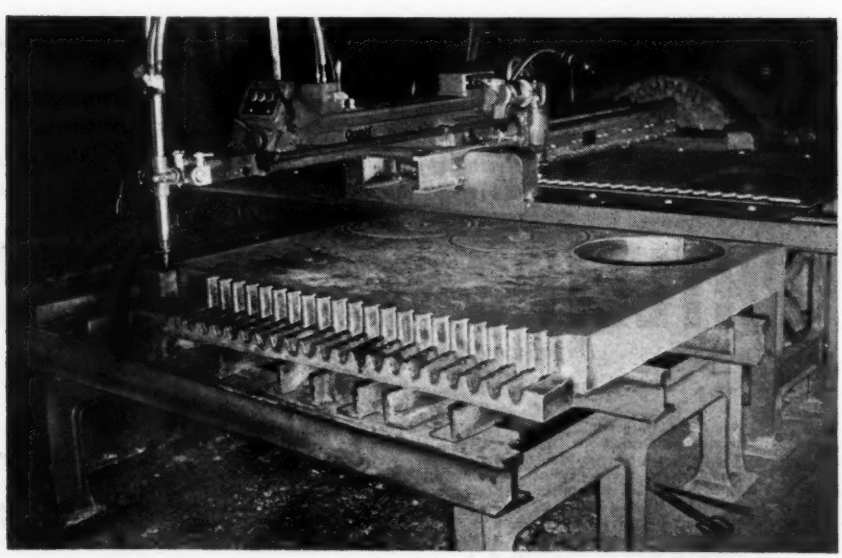
Since only a limited number of racks was to be cut, a templet for guiding the cutting machine was sawed out of 1/4-inch composition board instead of using an aluminum templet strip. This faster and cheaper method proved satisfactory in this case, because the templet was used only a few times.

The total cost for the material and the cutting of each rack was approximately $18.30, compared with $40—the estimated cost of a new cast rack. Flame-cutting was sufficiently accurate for this purpose so that no machining of the teeth was necessary.

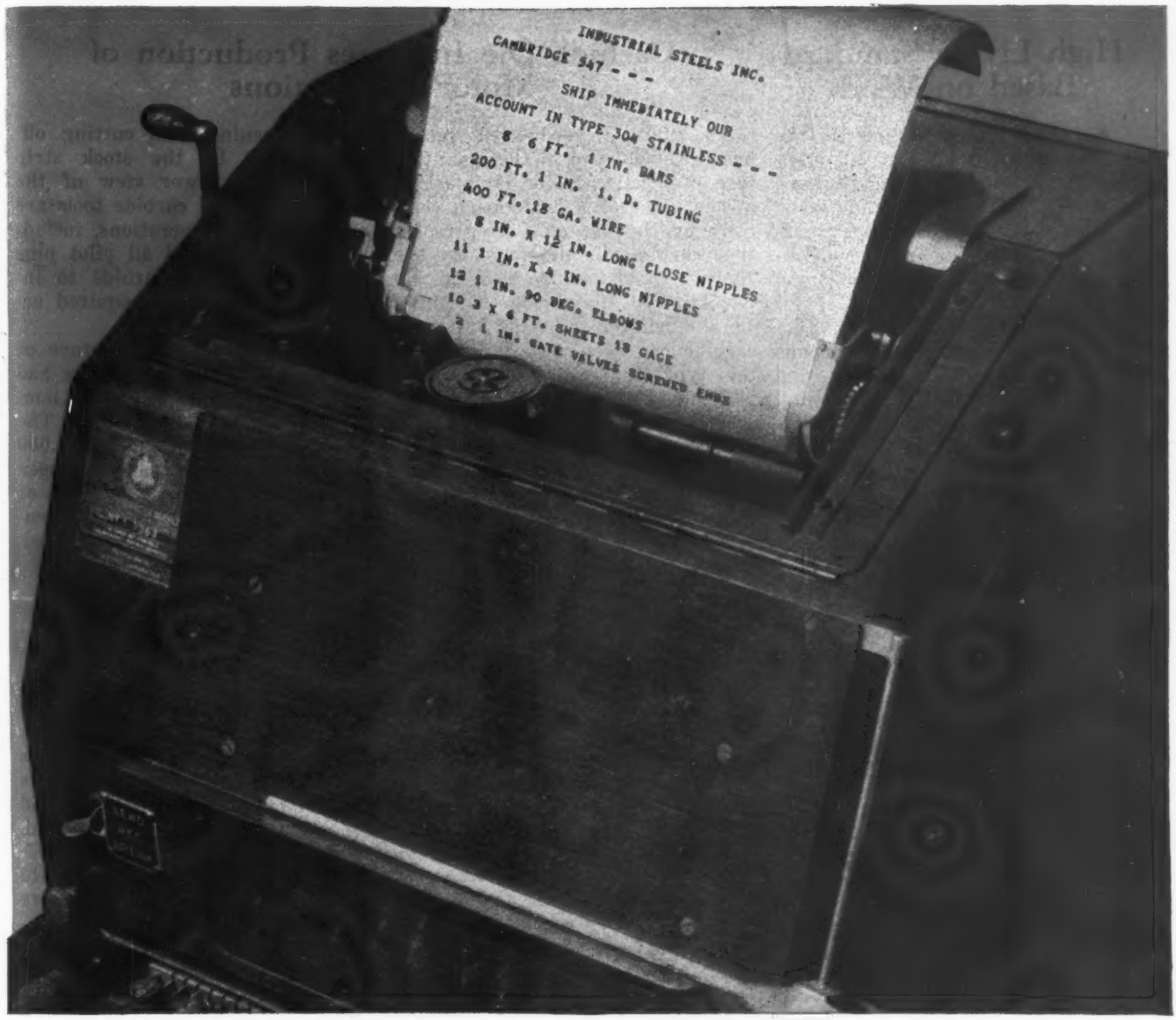
* * *

Strain Gage Conference

New uses for a testing gage the size of a postage stamp, which is solving engineering problems heretofore considered insoluble, were the basis for a conference of research engineers at the Waldorf-Astoria Hotel, New York City, September 27 and 28. The Baldwin Southwark Division of the Baldwin Locomotive Works, which manufactures this gage—known as the SR4 strain gage—sponsored the conference. Since its introduction about four years ago, this gage has been used for determining stresses and strains in hundreds of applications. Other Baldwin-Southwark testing equipment was also on display and was demonstrated by the company's representatives.



Oxweld Flame-cutting Machine and Completed Rack. Notice that a Pair of Racks is Actually Cut with Each Cut; also Note that Gear Blanks have been Cut from the Same Slab, Using the Same Machine. (Photograph Courtesy The Linde Air Products Company)



THE fabricator of stainless steel equipment whose order you see coming off the teletype machine . . . like many other users of Stainless shapes and parts . . . has learned that all his orders for Stainless will be filled completely and promptly from the huge warehouse stocks of INDUSTRIAL STEELS, INC.

There is no price premium for this complete service, regardless of quantity.

Now it is not necessary to place orders for Stainless with a number of suppliers. You can save time and money in ordering . . . and can avoid delays in deliveries . . . by letting one order do it all.

Whenever you need ANYTHING in Stainless, get in touch with INDUSTRIAL STEELS first.

INDUSTRIAL STEELS, INC.

Everything in Stainless

257 BENT STREET • CAMBRIDGE 41, MASS.
TROWBRIDGE 7000 • TELETYPE: CAMBRIDGE 547

SHEETS • BARS • TUBING • WIRE • VALVES • WELDING ELECTRODES • PUMPS • PIPE FITTINGS • HARDWARE

JLMCoCI-K1

Stainless STEELS

INDUSTRIAL STEELS, INC.
257 Bent St., Cambridge 41, Mass.

Gentlemen: Please put me on the list to receive your complete catalog on Stainless Steels.

Firm Name

Address

City Zone No. State

Your Name and Title

High Living Standard Based on Work

A better understanding of the fundamentals of industrial economics would do a great deal toward eliminating strife in the industries. Not only labor leaders and workers, but prominent men in Congress and in industrial management, fail to appreciate the real basis for our standard of living. Some seem to think that it depends wholly on wages in dollars and cents, others on "full employment," irrespective of the work being performed, and still others on "capital," which they think of as just money that can be withdrawn at will from use in industry. The fundamental fact that a high standard of living springs from the amount of production per worker, offered for sale at the lowest possible price, seems to escape almost everybody's attention.

* * *

New Industrial Motion Picture

A motion picture entitled "Golden Horizons" has been brought out by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis. This film shows the development of copper-base alloys, from the discovery of copper by primitive man until the present time. The alloying of bronze and its growing importance are portrayed colorfully. It is of interest to note that the film was written, produced, and acted by Ampco employes. This 16-millimeter color film, with narration and sound, is available to schools, engineering and technical societies, and similar groups interested in metals.

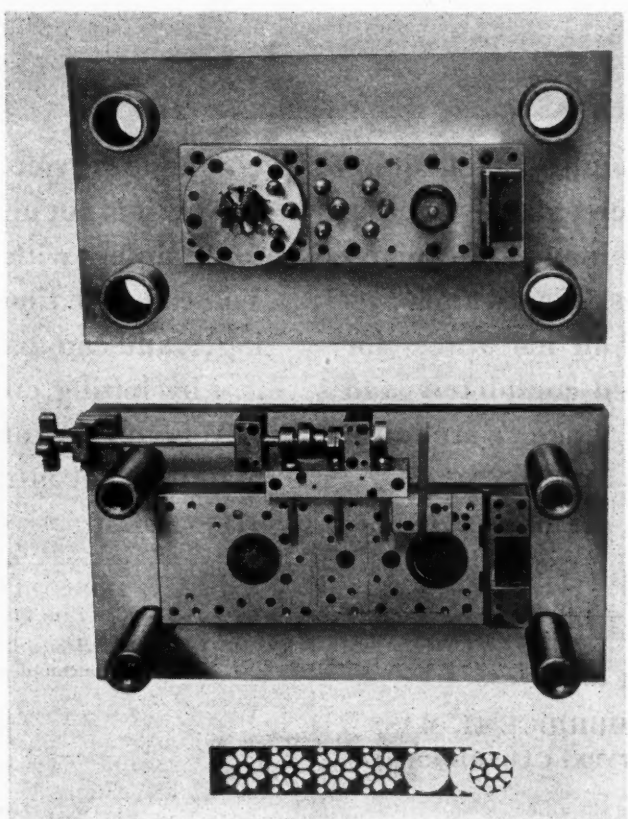
Carbide Die Increases Production of Motor Laminations

An unusual production record has been achieved in the manufacture of electric motor laminations at the plant of a well-known company by the use of a progressive type carbide die developed by the New England Carbide Tool Co., 60 Brookline St., Cambridge 39, Mass. This is believed to be the first time carbide has been used in a die of this type.

Although the original cost of the carbide die was approximately four or five times that of the steel die previously used, it quickly paid for itself through the exceptional increase in the number of parts produced between sharpenings. The carbide die is said to produce laminations that are flat and free from burrs. It is also claimed that tests of motors built with these laminations have shown them to be of superior quality.

The silicon steel strip stock used for the laminations is approximately 0.014 inch thick and 1 5/8 inches wide. The various steps in producing the laminations consist of punching nine teeth, four pilot holes, and a combination shaft and keyseat opening, and cutting off, as indicated by the stock strip shown in the lower view of the illustration. Solid carbide tools are used for all the operations, including cutting off, and all pilot pins are made of solid carbide to insure maintaining the required accuracy.

Previous to the manufacture of this die, high-speed steel dies had given a production of 35,000 laminations between sharpenings. The carbide die has produced 500,000 laminations and has not yet been resharpened; therefore, the life of the carbide die between sharpenings has not yet been established.



Progressive Die with Cutting Surfaces and Pilot Pins of Carbide which Increased Production and Improved Quality of Motor Laminations

* * *

Plastic "Glass" Panels for Control Boards

A new plastic "glass" for electrical control boards is now being used on board naval ships. This new material for the panels cuts down dangers to equipment and men in case of fire. The material, called glass "Melamine Micarta," is highly resistant to shock and is far more fire-resistant than materials that it replaces. The reason for this is that, when heated, it produces nitrogen which, being inert, smothers the flames. The production of Melamine Micarta panels has been worked out by plastic engineers of the Micarta Division of the Westinghouse Electric Corporation.

* * *

The United States Merchant Marine has been a participant in every major invasion of this war. About 700 merchant ships took part in the invasion of France. The importance of the Merchant Marine will be as great as ever in the years to come. Even now there are not enough ships for all needs.

SHELL TELLUS OILS TO PREVENT RUST

A protective "film" over metal surfaces is formed by specially fortified Shell Tellus Oils.

WATER AND AIR haven't a chance against the metal of hydraulic and lubricating systems where Shell Tellus Oils have gone to work.

The new Shell Tellus Oils are not designed to *remove* rust. They will not eliminate all existing rusting conditions that may be present in your machines. But, where moisture is a factor, the new Shell Tellus Oils, because of the special rust inhibiting qualities built into them, afford unequalled protection against the formation of rust. At the same time, moving parts are lubricated and protected against wear.

In addition to helping prevent rust, Shell Tellus Oils have other valuable assets. For example, they have high oxidation stability. This prevents sludge, keeps viscosity uniform, and enables the oil to shed moisture throughout long periods of service.

Still another advantage of this oil is its high viscosity index, which prevents wide fluctuation in oil viscosity with varying temperatures.

* * *

Why not try this new-type oil? It is available in a number of grades, providing necessary viscosity ranges for all normal applications. For details, get in touch with Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York; or 100 Bush Street, San Francisco 6, California.

SHELL

SHELL TELLUS OILS

News of the Industry

California

OSCAR NUSS has been appointed district manager of the Industrial Rubber Products Division of the Thermoid Co., Trenton, N. J., serving the Southern California, New Mexico, and Arizona areas. WALTER B. CHICK has been appointed district manager of the same division in the Northwest Pacific Coast area. He will be located at the San Francisco branch office of the company, 895 O'Farrell St., and Mr. Nuss will make his headquarters at the company's plant in Los Angeles, Calif.

GLOBE PRODUCTS MFG. CO., 3380 Robertson Blvd., Los Angeles 34, Calif., announces the purchase of the Machine Tool Division of the CLAYTON MFG. CO., Alhambra, Calif., manufacturer of the Clayton boring-bar holder and accessories. In addition to this product, the company's line now includes hand screw machines, bed turrets, cross-slides, vises, millers, end-mill holders, dividing heads, arbors, step blocks, milling dogs, and work-holding fixtures.

ROBERT HETHERINGTON & SON, INC., Sharon Hill, Pa., manufacturers of aircraft and industrial switches, control devices, and electronic counters, announce the opening of a West Coast office at 5607 W. Adams Blvd., Los Angeles, Calif. C. E. FISHER will have charge of sales in that territory, and L. E. MASSIE will be in charge of engineering.

WILLIAM E. HOARD, former assistant to the sales manager of the three West Coast plants of Western Gear Works, 417 Ninth Ave., S., Seattle 4, Wash., has been appointed sales manager of the San Francisco area for that firm and its associate, the Pacific Gear & Tool Works.

JAMES V. WINKLER has been added to the Los Angeles, Calif., staff of the Dow Chemical Co. as development engineer for magnesium on the West Coast. He was formerly in charge of experimental engineering at Dow's magnesium fabrication laboratory in Bay City, Mich.

FRANK J. SCHUMAN, 117 W. 9th St., Los Angeles 15, Calif., has been appointed district representative of the R-S Products Corporation, Industrial Heat-Treating Furnace Division, Philadelphia, Pa.

CARL P. SORENSON has been appointed consulting standards engineer for the Cherry Rivet Co. of Los Angeles, Calif. Mr. Sorenson was formerly connected with the Glenn L. Martin Co. of Baltimore, Md.

MENASCO MFG. CO., Burbank, Calif., announces the acquisition of the business of the Malabar Machine Co., Los Angeles, Calif., manufacturer of hydro-mechanical jacks.

District of Columbia, Maryland, and West Virginia

FOUNDRY RUBBER COMPOUNDS CORPORATION, 1050 Thirtieth St., N.W., Washington, D. C., has purchased from HERBERT R. ISENBURGER and the ST. JOHN X-RAY SERVICE, INC., of Long Island City, N. Y., their "Bonis" permanent mold and die coating business. "Bonis" is a mold dressing for preserving the surface of a mold and thus prolonging its life.

STANLEY P. WATKINS has been appointed manager of the Market Development Division of the Rustless Iron and Steel Corporation, 3400 E. Chase St., Baltimore 13, Md. Mr. Watkins was previously manager of the sales engineering department. In his new post, he succeeds W. B. PIERCE, who has resigned.

ROBINS CONVEYORS, INC., and its affiliate HEWITT RUBBER CORPORATION have opened a new office in the United Carbon Bldg., Charleston, W. Va. R. U. JACKSON, who has represented Robins Conveyors in that territory for fifteen years, will be in charge of the office, assisted by H. N. KEPLER, formerly in the Washington office.

Illinois

ERIC S. CARLSTEIN has been appointed general manager and assistant to the president of the Pines Engineering Co., Aurora, Ill., manufacturer of tube fabricating equipment, benders, profilers, cut-off machines and testing equipment. Mr. Carlstein was formerly chief engineer of the Batavia Metal Products Co. C. F. COATS, formerly of the Western Condenser Co., Watseka, Ill., has been appointed purchasing agent.

O. M. HULLINGER has been appointed manager of the Chicago office of the Elastic Stop Nut Corporation of America, Union, N. J. Mr. Hullinger's headquarters will be at 20 N. Wacker Drive, Chicago. He was previously connected with the Line Material Co., where he served as manager of transformer sales.

R. C. PAGE and W. A. REDPATH have been appointed assistant managers of sales at the Chicago plant of Joseph T. Ryerson & Son, Inc., steel distributors. Mr. Redpath began his career with the Ryerson organization in 1916, and Mr. Page in 1917, both as messengers in the mailing department.

R. C. Page (Left) and W. A. Redpath (Right), Newly Appointed Assistant Managers of Sales at the Chicago Plant of Joseph T. Ryerson & Son, Inc.

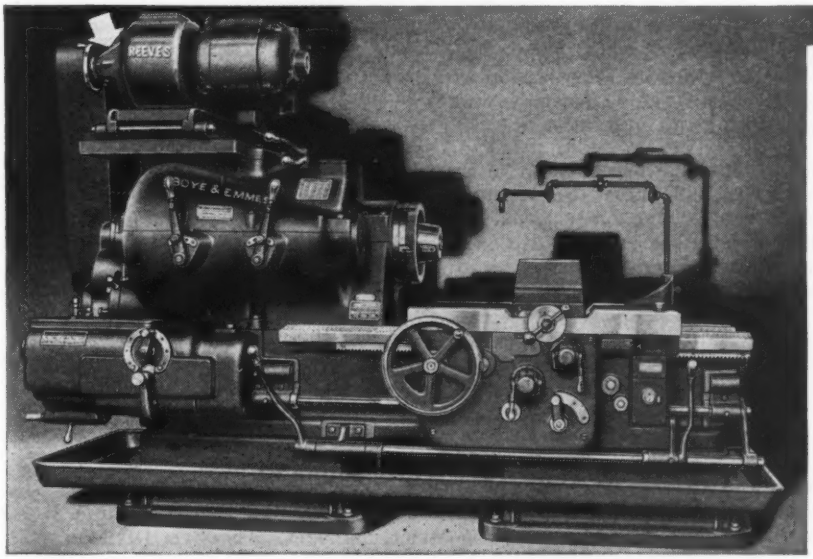
Process Faster, Better under every changing condition

INSTALL REEVES-EQUIPPED MACHINES: Off the drawing boards, out of the laboratories and experimental rooms, new streamlined models of thousands of production machines are coming forth.

A new era of building and construction, of making and selling things for better living has begun. The old American Spirit of Competition is to bloom again.

Machines that have the edge in competition will include among their advantages—*complete speed adjustability,* as provided by REEVES. Record breaking production of the materials and weapons of war proved as never before that the right speed for each changing condition gets any job done better and faster.

Designers and builders of 1,871 different makes of machines now include REEVES Variable Speed Control as standard equipment. And the list is growing rapidly. Look for the familiar REEVES handwheel on any machine you buy. It is your assurance of faster, better processing under every changing condition . . . REEVES Speed Control is easily applied to machines in service. Write for copy of 96-page catalog M-450, containing complete information.



Typical Example—24" x 7' bed Engine Lathe, manufactured by Boye & Emmes, standardly equipped with the REEVES Motodrive for complete speed adjustability. Installation provides any speed over a range of 3.5 to 301 r.p.m. Said one user of this equipment, "Even one r.p.m. of speed adjustment gives a higher rate of production."

ALL THESE ADVANTAGES

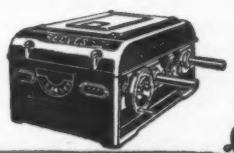
REEVES-*equipped machines have complete speed adjustability*— at just a few speeds but any speed between predetermined limits.

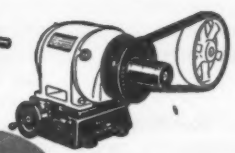
REEVES-equipped machines have wider work ranges—because the *correct* speeds are always available for handling many different sizes, shapes and kinds of products at most efficient production rates.

FULL CAPACITIES *of men and machines are released* because *convenient* for operators to use the speeds that match their skills and experience. Production increases of 25 to 50 per cent are not unusual.

GREATER PRECISION *in processing* because the most efficient speed can be accurately secured and maintained without slippage or fluctuation as long as desired, insuring uniform quality at a faster rate—fewer rejects; less time and materials wasted; advantages vital to economical production.

VARIABLE SPEED TRANSMISSION for infinite speed adjustability over wide range of speed ratios, 2:1 through 16:1 and in sizes to 87 h.p.



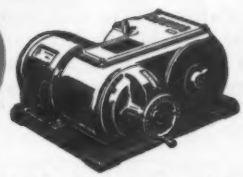


VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive. Sizes to 15 h.p. Speed variation within 4:1.

Accurate Variable

REEVES Speed Control

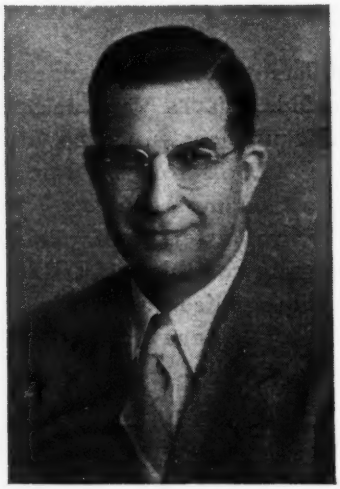
Gives the Right Speed for Every Job!



MOTODRIVE combines motor, speed varying mechanism, reduction gears in one compact unit. Sizes to 15 h.p. Speed variation 2:1 through 6:1.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

HARLEY W. WHITMORE has been appointed chief engineer of the 'Deepfreeze' Division of Motor Products Corporation, North Chicago, Ill., and will assume responsibility for the continued development of the line of 'Deepfreeze' industrial sub-zero chilling machines and home freezing units. Mr. Whitmore has had an extensive experience in the refrigeration field, and has been instrumental in



Harley W. Whitmore, Newly Appointed Chief Engineer of 'Deepfreeze' Division, Motor Products Corporation

the development of locker-plant evaporators, freezer rooms, altitude chambers, industrial and domestic sub-zero chilling units, and many other types of refrigeration equipment.

INDUSTRIAL OVEN ENGINEERING CO., Cleveland, Ohio, has opened a branch office at 332 S. Michigan Ave., Chicago, Ill. H. W. MUNDAY and F. T. GREAVES are in charge of the Chicago office.

FORWARD TOOL & MFG. CO. has moved to new quarters at 2017 N. Parkside Ave., Chicago 39, Ill.

Indiana

MORTON I. DORFAN has been appointed manager of the Dust and Fume Engineering Division of the American Foundry Equipment Co., Mishawaka, Ind. He will supervise and coordinate the company's expanded dust control sales, engineering, and research activities.

CARPENTER STEEL CO., Reading, Pa., has removed its Indianapolis warehouse from 633 Fulton St. to new and larger quarters at 1618 W. Washington St., Indianapolis 8, Ind. K. L. CRICKMAN is in charge of the new warehouse.

Michigan

DONALD WILLIAMS has been appointed general sales manager of the Dow Chemical Co., Midland, Mich., and DONALD K. BALLMAN has been made assistant general sales manager. Mr. Williams has been assistant general sales manager since 1933, having been connected with the organization since 1924. Mr. Ballman was previously manager of the Technical Service and Development Division of the company. He has been with the Dow organization since 1935. LELAND I. DOAN, who has been general sales manager for the last sixteen years, assumes the position of director of sales. He is also a vice-president of the company.

RUSSEL A. SCHULTZ has joined the Robbins Engineering Co., 318 Midland Ave., Detroit 8, Mich., in the capacity of vice-president in charge of engineering and sales. J. H. HAGEN has been elected vice-president and factory manager of the company. Mr. Schultz was associated for twenty-one years with the Chevrolet Motor Division of General Motors Corporation, his last position having been master mechanic of the aviation plant in Buffalo. Mr. Hagen has been with the Robbins Engineering Co. since its organization in 1929. He started as a foreman and later became plant superintendent.

VASCOLOY-RAMET CORPORATION, North Chicago, Ill., announces the removal of its Detroit branch office to larger quarters at 512 Book Bldg. A. R. CONTI continues in charge of sales and service in that district. The branch office of the FANSTEEL METALLURGICAL CORPORATION, an affiliate company, is maintained at the same address. The Detroit branch carries stocks of carbide tools and blanks and Tantung tools for immediate delivery.

WILBUR F. CAMPBELL has resigned as assistant to the president of the Pioneer Engineering & Mfg. Co., Detroit, Mich. His duties included handling the legal aspects of war contracts and government relations. Mr. Campbell plans to re-enter private practice and specialize on income tax matters, labor relations, and administrative law. He has opened offices at 3180 Penobscot Bldg., Detroit, Mich.

LIEUTENANT COLONEL H. A. STEVENSON, General Staff Corps of the Army Service Forces, has been retired to inactive duty and has returned to his former business—the distribution in the Michigan territory of the trucks, tractors, and cranes made by the Baker Industrial Truck Co., Cleveland, Ohio. His headquarters are at 7310 Woodward Ave., Detroit 2, Mich.

GEOMETRIC TOOL CO., New Haven 15, Conn., announces that its Detroit office has been consolidated with the Detroit plant and office of the Greenfield Tap & Die Corporation at 5850 Second Blvd., Detroit 2, Mich. M. GLEN HOOK, manager of the Geometric Detroit office, has retired. W. J. RANDALL continues as field engineer in that district.

PAGE STEEL & WIRE DIVISION OF THE AMERICAN CHAIN & CABLE CO., INC., Bridgeport 2, Conn., has established a sales office in the General Motors Bldg., Detroit, Mich. E. B. BRANT and W. R. STEPHENS, formerly with the Page plant at Monessen, Pa., will make their headquarters at the Detroit office.

Missouri and Tennessee

LINCOLN ELECTRIC CO., Cleveland, Ohio, announces the opening of a direct factory branch sales office at 4427 Manchester Ave., St. Louis, Mo. The new branch will be under the direction of B. J. BRUGGE, who has been connected with the company since 1931. For the last year, Mr. Brugge has been in the Detroit area assisting firms in the design and fabrication of both war and post-war products.

FRANK C. CLINE, special representative for the Westinghouse Lamp Division in its northwestern district headquarters at Chicago, has been appointed acting manager of the southwestern district, with headquarters at St. Louis, Mo. Mr. Cline succeeds DAN M. GALVIN.

DIESEL EQUIPMENT CO., 308 S. 2nd St., Memphis, Tenn., has been appointed distributor for the BRIGGS CLARIFIER Co., Washington, D. C., and Bethesda, Md., manufacturer of industrial and marine oil filtration equipment.

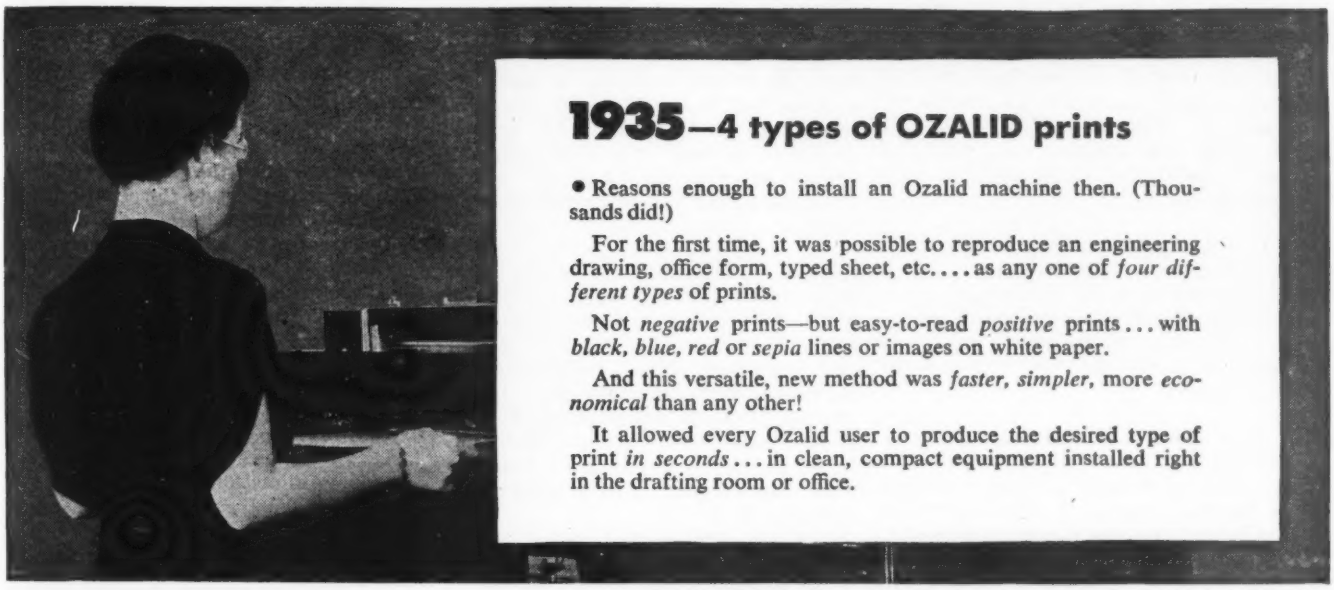
New England

F. W. ELYA has been appointed district manager, Abrasive Division of the newly created Northeastern District by the Norton Co., Worcester, Mass. Mr. Elya's headquarters will be in Worcester, and his territory will comprise Massachusetts, Rhode Island, Vermont, New Hampshire, Maine, and New York State with the exception of southeastern and southwestern counties. He has been connected with the Norton Co., for thirty-three years, and for the last twenty years has been abrasive engineer for western New York State, with headquarters in Rochester. R. J. FORKEY, who has been abrasive engineer in the Syracuse territory, will take over the western New York State area formerly covered by Mr. Elya, and ROBERT CUSHMAN from the Worcester office will take over Mr. Forkey's former territory.

ROBERT S. ROSE has been appointed district sales manager of the new sales

Why an OZALID machine

increases in value from year to year



1935—4 types of OZALID prints

• Reasons enough to install an Ozalid machine then. (Thousands did!)

For the first time, it was possible to reproduce an engineering drawing, office form, typed sheet, etc. . . . as any one of *four different types* of prints.

Not *negative* prints—but easy-to-read *positive* prints . . . with *black, blue, red* or *sepia* lines or images on white paper.

And this versatile, new method was *faster, simpler,* more *economical* than any other!

It allowed every Ozalid user to produce the desired type of print *in seconds* . . . in clean, compact equipment installed right in the drafting room or office.

1945—10 types of OZALID prints

• Since 1935, Ozalid has created product after product—which can be processed in the same unique manner in *any* Ozalid machine.

So that today you can make *10* types of prints . . . and use them in innumerable ways. Ways you will consider all the more amazing if you've been seeing, using, and "stretching" only *one* type of print!

1. **Black-line**
2. **Blue-line**
3. **Red-line**
4. **Sepia-line Intermediate**
5. **Transblack Intermediate**
6. **Transparent Cloth**
7. **Transparent Foil**
8. **Opaque Cloth**
9. **Chartfilm**
10. **Dryphoto**

Each one of the ten OZALID types has its advantages. For example, you can use different colors to identify work prints of different departments. You can employ Ozalid Intermediates to save time and labor when changing art and drafting designs or financial reports. And new *Ozalid Dryphoto* when you want to reproduce continuous tone photographic material for sales, advertising, and general display purposes.

Furthermore, you'll find many personalized uses for Ozalid . . . recognizing it as not merely a reproduction process, but as a new graphic art which projects the use of your equipment beyond the drafting room and shop . . . to *all* departments!

Ten types of prints is only the beginning for Ozalid. And the machine you invest in today—besides giving you immediate advantages—will provide even greater versatility tomorrow.

Write for free catalog and OZALID samples to Dept. 20

OZALID

Division of General Aniline and Film Corporation
Johnson City, New York

OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL

office opened by the Latrobe Electric Steel Co. in Boston, Mass. The new office covers the territory of eastern Massachusetts, Rhode Island, New Hampshire, and Maine. It is located in the Rice Bldg., 10 High St., Boston 10, Mass.

ASA S. COOK CO., well-known manufacturer of wood screw machinery, originally located in Hartford and later in New Haven, Conn., has moved its equipment to the enlarged plant of the Standard Machinery Co., 1475 Elmwood Ave., Providence 7, R. I. ROBERT F. MOYER has been elected president and treasurer, and ARVID N. LARSON, general manager.

C. W. YERGER, formerly executive vice-president of the Hanson-Van Winkle-Munning Co., Matawan, N. J., has joined the executive staff of the Lea Mfg. Co., Waterbury, Conn., and has been elected chairman of the board of directors.

CHANDLER-EVANS CORPORATION, manufacturer of carburetors, fuel pumps, and other accessories, formerly located at Meriden, Conn., is being moved to the plant of the parent company, NILES-BEMENT-POND CO., West Hartford, Conn. There will be no change in the separate identity of the products of the Chandler-Evans Corporation. ALEXANDER M. WRIGHT has been appointed assistant general manager, and FLOYD C. GUSTAFSON sales manager of the corporation. Mr. Wright joined the organization in 1941, and has been manager of the Chandler-Evans Dayton plant since its construction early in 1942. Mr. Gustafson became connected with the engineering department of the corporation in 1938. For a time he was service manager.

New Jersey

ROBERT W. BURGESS has been appointed plant manager in charge of engineering and tool production of the Service Machine Co., Elizabeth, N. J. He formerly supervised all war contract tooling and was advisor on war production to the Easy Washing Machine Co., Syracuse, N. Y. FRED MENNING has been appointed purchasing agent of the company. CLARENCE BRITTAIN is now in charge of tool processing, and G. LALAK has been placed in charge of tool and die design. ALLEN G. BURDETT has been made executive vice-president, and has taken over the duties of the president, who recently retired.

FRED F. KLETT has been appointed chief engineer of Lenox, Inc., Trenton, N. J. He was formerly chief engineer of the Fred Goat Co., Brooklyn, N. Y., and has been chief equipment development engineer of the RCA Victor Crystal Division, Camden, N. J., and of the Radio Tube Division, Harrison, N. J. He has also been chief designer with the Eisler Engineering Co., Newark, N. J.

COOPER ALLOY FOUNDRY CO., Hillside, N. J., announces the establishment of a sub-division devoted exclusively to the precision casting of small intricate parts. The new division is known as the PRECISE CASTINGS CORPORATION DIVISION OF THE COOPER ALLOY FOUNDRY CO., and is located at 123 Van Buren St., Newark, N. J.

AIRCRAFT PARTS DEVELOPMENT CORPORATION, Summit, N. J., has changed its name to HUNGERFORD RESEARCH CORPORATION and has moved to a new laboratory building in Murray Hill, N. J. The company will continue to specialize in the application of powdered metals and plastics to mechanical and electrical products.

E. G. CROSS has recently been appointed supervisor of the production planning and control department of the Crocker-Wheeler Division, Joshua Hendy Iron Works at Ampere, N. J.

New York

G. EDWARD PENDRAY, for the last nine years assistant to the president of the Westinghouse Electric Corporation, in charge of public relations and education, has opened an office of his own as counselor in management, public relations, and education at 55 W. 42nd St., New York. An error was made in giving this address in September MACHINERY.

LEPEL HIGH FREQUENCY LABORATORIES, INC., 39 W. 60th St., New York 23, N. Y., a pioneer in the field of high-frequency induction heating, has acquired the business, good will, and assets of the Induction Heating Division of the Van Norman Co., Springfield, Mass., machine tool manufacturers. The service for Van Norman units now in use in industry will be maintained by the Lepel organization.

H. J. FRENCH has resigned as assistant director for raw materials and facilities of the Steel Division, War Production Board, Washington, D. C., and has resumed his duties as assistant manager of the Development and Research Division of the International Nickel Co., Inc., 67 Wall Street, New York 5, N. Y. He has served on the WPB forty-two months.

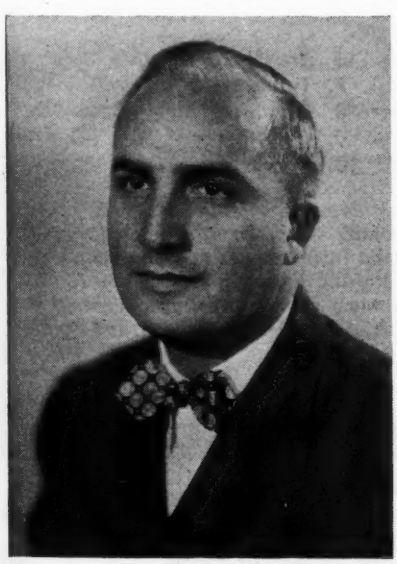
CLARENCE LESLIE WILLIAMS has joined the staff of sales engineers of the Foxboro Co., Foxboro, Mass. He will have headquarters in the company's New York office, 420 Lexington Ave., and will be assigned to the northern New Jersey territory.

E. D. WACKER has been appointed general manager of the C. J. Tagliabue Division of the Portable Products Corporation, Brooklyn, N. Y. For the last eight years, he has been general sales manager.

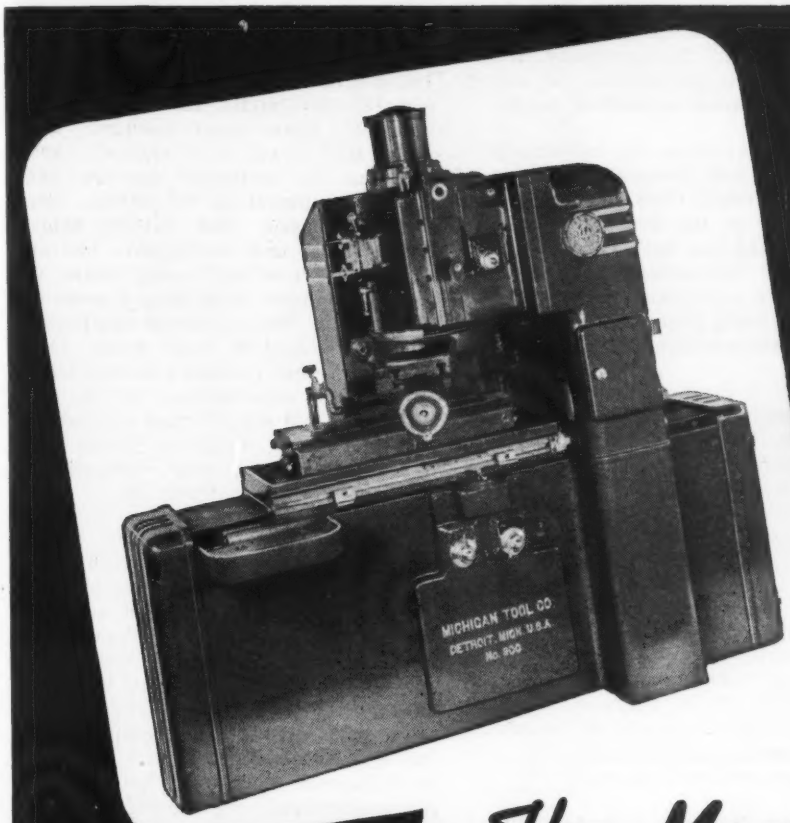
HARRY A. WINNE, vice-president in charge of engineering for the General Electric Co.'s apparatus department, has been appointed vice-president in charge of engineering policy for the entire company.

TITAN METAL MFG. CO., Bellefonte, Pa., has created an International Division, with headquarters at 70 Pine St., New York 5, N. Y. JEAN PAUL ELKANN will assume direction of the new export office.

Alexander M. Wright, New Assistant General Manager Chandler-Evans Corporation



Floyd C. Gustafson, Newly Appointed Sales Manager of Chandler-Evans Corporation



The Machine that's NEVER BEEN LICKED

For either spur or helical gears, where day in and day out output really counts, where cost per piece is important, where accuracies *must* be maintained over long runs, even "Michigan" itself has not been able to "lick" the rack type gear finishing machine. The best we have been able to do is improve the machine for even greater accuracy in production, greater flexibility, better ease of adjustment and faster operation.

Fundamentally however, the Series 900 Michigan gear shaver operates on the same principle—generating gears from a basic rack—that it did when it first revolutionized gear manufacturing methods. This most accurate of generating methods permits the production of accurate gears by the millions at a *lower* cost than for less accurate gears.

Designed for mass production of spur or helical gears, splines, etc. ranging up to 8 inch diameter and 2 inch face width.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD • DETROIT 12, U. S. A.

Ohio

HARRY W. BARKLEY has been appointed executive vice-president and general manager of the National Tool Co., Cleveland, Ohio, manufacturer of high-precision metal-cutting tools. Mr.

Harry W. Barkley, Executive Vice-president and General Manager, National Tool Co.

Barkley was connected for twenty-seven years with the Ford Motor Co., having previously served as superintendent of the Ford Highland Park plant.

L. H. GEGENHEIMER, after a four-year leave of absence for war duties in Washington, is back with the Timken Roller Bearing Co., Canton, Ohio, in his former capacity as sales engineer in the Industrial Division. Mr. Gegenheimer was first lent by the Timken company to the British Ministry of Supply, where he was supply officer until December, 1943, after which he became a dollar-a-year man with the War Production Board. When he left the War Production Board, he had become chief of the Bearing Branch of the Tools Division, a post formerly held by HOWARD C. SAUER, another Timken employe, now head of Timken's foreign division.

WARNER & SWASEY CO., Cleveland, Ohio, builder of machine tools, chiefly turret lathes, for over sixty years, expanded its facilities to meet the war demand considerably beyond the peacetime requirements for machine tool manufacture. To utilize these excess facilities, the company, as a first step in a long-term program of product diversification, is entering the textile machinery field. Production of a knitting machine of improved type is planned for the near future, and other types of textile equipment are under consideration. The company is also studying the possibilities in several other industrial equipment fields.

JOHN A. ALLWOOD, JR., executive vice-president and general manager of Lear, Inc., Piqua, Ohio, has been elected a member of the board of directors. Mr. Allwood has been connected with the Lear organization since 1942, serving as consultant on gearing and general mechanical problems prior to his present position.

FRANK J. LASKEY, general purchasing agent of the Republic Steel Corporation, Cleveland, Ohio, has been made manager of purchases and raw materials, succeeding C. A. ILGENFRITZ, who is now connected with the United States Steel Corporation. WILLIAM T. ADAMS becomes general purchasing agent.

INDUSTRIAL HYDRAULICS CORPORATION has recently established offices in the Cleveland Trust Bank Bldg. at Painesville, Ohio. W. T. STEPHENS is president and chief engineer of the corporation, and W. B. MCCLELLAND vice-president and sales manager.

CARLTON MACHINE TOOL CO., Cincinnati, Ohio, has been added to the list of companies who are associated in the AMTEA (American Machine Tool Export Associates) Corporation, 350 Fifth Ave., New York 1, N. Y.

Pennsylvania

W. L. O'BRIEN has been promoted to the position of manager of the Stainless Steel Division of the Jessop Steel Co., Washington, Pa. Mr. O'Brien was previously district manager in Indianapolis, and has been connected with the company since May, 1943.

W. L. O'Brien, New Manager of Stainless Steel Division, Jessop Steel Co.

WILLIAM SELLERS & CO., Philadelphia, Pa., announce that they have established a Hydraulic and Special Machinery Division under the direction of JOHN C. GRAF, sales manager, and JOHN B. CUTLER, chief engineer, specializing in hydraulic presses and special equipment for the ferrous, nonferrous, plastic, and rubber fields. Messrs. Graf and Cutler have had an experience covering twenty years in the development of molding presses of all types, as well as special equipment and molds used in these fields. The company recently added a Marine Division to the organization, for the development and manufacture of modern ship machinery, including electro and hydraulic steering gear, telemotors, capstans, cranes, winches, etc.

WALTER J. GREENLEAF CO., Pittsburgh, Pa., announces the formation of a new national distributing organization in the industrial and automotive lubrication field to be known as the GREENLEAF CORPORATION, with headquarters in the Penn Bldg., Wilkinsburg (Pittsburgh 21) Pa. The corporation will introduce a complete new line of natural flake graphite products for industrial lubrication, hot machining applications, engine and automotive lubrication, and tool treatment.

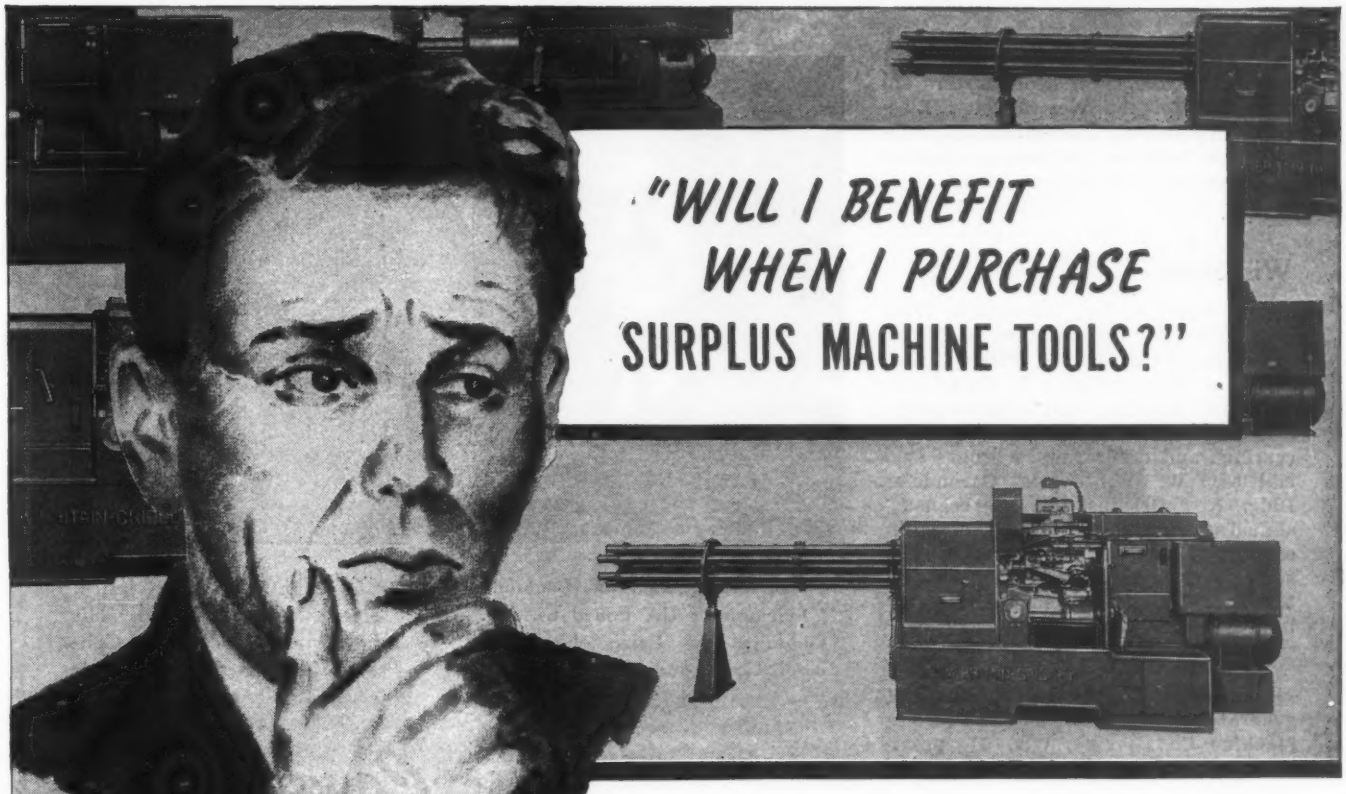
WILLIAM C. ROBINSON, who has been assistant to the director of personnel relations for the Lukens Steel Co., Coatesville, Pa., and its divisions, By-Products Steel Corporation and Lukenweld, Inc., since February, 1944, has been appointed assistant director. Mr. Robinson was previously connected with the Mead Corporation of Chillicothe, Ohio, in the capacity of assistant director of personnel relations.

ADOLPH G. HOCHBAUM has been appointed managing director for exports to the U.S.S.R. and general sales representative for central and eastern European countries for the Baldwin Locomotive Works, Philadelphia, Pa. He has been with the Baldwin organization since 1939, handling various products for Russia.

EDWARD DE LUCA has recently become associated with the Machine & Tool Designing Co., Philadelphia, Pa., as field representative in the South. He will make his headquarters at 1716 Landon St., Jacksonville, Fla.

JAMES A. BAUBIE has been appointed director of the public relations department of the Westinghouse Electric Corporation, Pittsburgh, Pa. He was previously assistant manager.

W. H. MCCORMICK has been appointed chief metallurgist of the Park Works of the Crucible Steel Co. of America, at Pittsburgh, Pa. He has been with the Crucible organization for seventeen years.



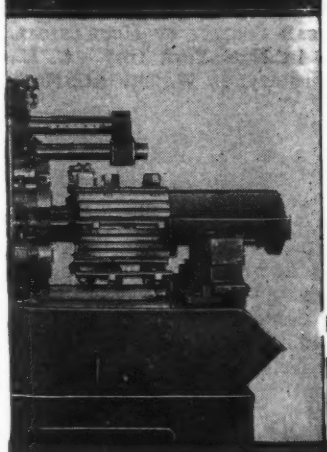
"WILL I BENEFIT WHEN I PURCHASE SURPLUS MACHINE TOOLS?"

If you are contemplating the purchase of Surplus Machine Tools, it will pay you first to investigate particulars with the manufacturer. He alone can relate the entire history of the machine from original blueprints, tool specifications and service records . . . assuring your not buying a "pig in a poke".

War production has been gruelling and as a result many fine machine tools are due to retire, some should be rehabilitated in part, and others should be entirely overhauled. Take time to become acquainted with the machine's application, capacity, age and general condition. Consider the reconversion, replacement and maintenance costs. Then compare the total investment with the cost of a new model designed and tooled to meet your manufacturing requirements.

A plant adequately and properly equipped with efficient production machinery will be in a better position to cope with today's new developments in metallurgy and metalworking techniques. Costs will be lowered, and the product demand will increase which, in turn, will account for greater employment.

The ability of surplus New Britain-Gridley bar and chucking machines to continue to provide fast, accurate and economical peacetime production will be guided largely through intelligent redistribution and conversion. Let us help you. Consult with our nearby Sales-Engineer or, should you prefer, communicate direct.



NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

Manufacturers of Multiple Spindle
Automatic Bar and Chucking Machines
Mechanics Hand Tools • Shop Furniture

M-01016

A. C. MONTEITH has been appointed assistant manager of headquarters engineering for the Westinghouse Electric Corporation, Pittsburgh, Pa. He will also hold the position of director of education.

Wisconsin

AMPCO METAL, INC., Milwaukee, Wis., announces the appointment of N. A. DOOLITTLE, 1850 E. 16th Place, Tulsa, Okla., as representative in Oklahoma, southern Kansas, and southwestern Missouri for the sale of Ampco metal castings and other Ampco bronze specialties. W. W. SWAN, Carondelet Bldg., New Orleans, La., has been assigned a number of counties in southeastern Texas, in addition to the states of Louisiana, Alabama, and Mississippi that he has previously been covering.

JAMES E. THOMS has been appointed vice-president in charge of sales and general administration for the Peerless Machine Co., Racine, Wis. He previously held the position of sales manager.

Canada

PETER H. W. B. LECKIE-EWING has joined the technical staff of the Union Twist Drill Co., Butterfield Division, Rock Island, Quebec, Canada, as metallurgist and chief of the Cutting Tools Research Department. Mr. Leckie-Ewing is an honor graduate of the University of British Columbia, Vancouver, B. C., in metallurgical engineering, and obtained his master's degree at Massachusetts Institute of Technology, Cambridge, Mass. Following graduation from M.I.T., Mr. Leckie-Ewing was with Atlas Steels Ltd., Welland, Ontario, for three years as ordnance metallurgist, after which he became affiliated with the War Metals Research Board, Vancouver, from which he resigned to join the Union Twist Drill Co.

Peter H. W. B. Leckie-Ewing, Chief of Cutting Tools Research Dept., Butterfield Division of Union Twist Drill Co.

H. B. Kraut, Who has Become Chairman of the Board of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Lieutenant Colonel Ralph J. Kraut, Who Succeeds His Father as President and General Manager of the Company

Obituaries

ROBERT ATKINSON, district manager since 1927 of the Steel and Tube Division of the Timken Roller Bearing Co., Detroit, Mich., died in the Alexander Blaine Hospital, Detroit, on September 2, following a month's illness, at the age of fifty-three years. Mr. Atkinson was born in Holly, Mich., and at the time of his death lived in Birmingham, a suburb of Detroit. He received a Bachelor of Science degree from the University of Michigan in 1914, and the following year a Master of Science degree in chemical engineering. He was a member of the Detroit chapter of the American Society for Metals. His wife and three daughters survive him.

HARRY W. BAILS, for the last thirty-three years purchasing agent of the Barber-Colman Co., Rockford, Ill., died on July 22. He had been with the Barber-Colman Co. since 1905.

ARTHUR M. BREWSTER, New England field engineer for Advance Pressure Castings, Inc., Brooklyn, N. Y., died on August 30 at the age of sixty-five.

Coming Events

OCTOBER 2-3—Second annual meeting of the MAGNESIUM ASSOCIATION at the Waldorf-Astoria Hotel, New York City. Secretary's office, 3239 R C A Bldg., 30 Rockefeller Plaza, New York 20, N. Y.

OCTOBER 2-3—Meeting of the Cincinnati section of the AMERICAN SOCIETY of MECHANICAL ENGINEERS to be held at the Netherland Plaza Hotel, Cincinnati, Ohio, replacing the fall meeting of the Society, which was canceled in accordance with the rulings of the Office of Defense Transportation.

NOVEMBER 26-30—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

* * *

To raise wage rates without a compensating increase in productivity or a lowering of other costs will make higher prices necessary unless a margin of profit exists which can be safely reduced. If that condition does not exist, losses may occur and there will be no incentive to expand production and employment. The wage rate is not a true measure of cost. The important factor is productivity per man-hour, which depends upon (1) the efficiency of machinery and equipment used; (2) the efficiency of management; (3) the efficiency of workers; and (4) the willingness of workers to let their productivity rise.—*Stevenson, Jordan & Harrison, Inc.*

New Books and Publications

PROCEDURE HANDBOOK OF ARC-WELDING DESIGN AND PRACTICE. 1312 pages, 6 by 9 inches; 1647 illustrations. Published by the Lincoln Electric Co., Cleveland 1, Ohio. Price, $1.50 in the United States; $2 elsewhere.

This is the eighth edition of a comprehensive handbook on arc-welding design and practice, which has been entirely revised to include the latest data on arc-welding methods and equipment. A special effort has been made by the authors to provide complete information to help those in all fields of industry to obtain the greatest possible benefits from the process of arc welding in the design and construction of various parts and products and in the use of the process as a maintenance tool. Many new illustrations covering significant welding applications developed for war production which heretofore have not been published due to restriction are included.

In addition to standard data on welding symbols, speeds and costs, characteristics of metals, preheating, stress relieving, approach to welded design, and other pertinent information, the revised handbook includes the following new subjects: New cost tables; mathematical calculations for new weld-designed structures; latest steel specifications of SAE and AISI, including National Emergency steels, etc.; under-water cutting; shop ventilation; maintenance of welding equipment; methods of testing; and filler metal specifications for arc-welding electrodes.

The principal sections of the book cover the following subjects: Welding methods and equipment; technique of welding; procedures, speeds and costs; weld metal and methods of testing; weldability of metals; welded steel construction—machine design; designing of arc-welded structures; and applications of arc welding in manufacturing, construction, and maintenance.

HIGH-PRESSURE DIE-CASTING—A DESIGN GUIDE FOR ENGINEERS. By H. L. (Red) Harvill and Paul R. Jordan. 130 pages, 7 by 10 inches. Published by the H. L. Harvill Mfg. Co., 2223 E. 37th St., Los Angeles 11, Calif. Price, $5.

This book, dealing with high-pressure die-casting, emphasizes in particular the design aspects of the subject. In the first twenty pages, the process of die-casting and the metals used are outlined. The remainder of the text describes the types of die-casting dies, and discusses the relationship of casting design to die design and the importance of the correct design of parts to be produced by the die-casting method. One chapter is devoted to pressure-mold or premium-quality die-castings, with particular reference to recent specifications. The book deals also with some of the simplified methods of machining die-castings, as well as with the finishing and inspecting of die-cast parts. Case histories of twenty-five typical die-castings are given. A complete glossary of die-casting terminology is included.

THE MACHINISTS' AND DRAFTSMEN'S HANDBOOK. By Albert M. Wagener and Harlan R. Arthur. 662 pages, 5½ by 8 inches. Published by the D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. Price, $4.50.

The authors have attempted, as stated in the preface, to present in one volume a reference work for machinists and draftsmen that will contain all the basic information required in a great majority of their average daily jobs. A critical selection of material has been made to suit the space available. Many solutions of the more elementary mathematical problems are presented in considerable detail. The book contains nineteen sections, covering the following subjects: Symbols and Mathematics; Parts of the Circle; Areas; Volumes; Geometrical Constructions; Weights and Measures; Triangulation; Drills; Threads; Spur Gearing; Milling Tables; Tapers; Miscellaneous Tables; Speeds, Feeds, and Cutting Tools; Dies and Presses; Metals; Strength of Materials; Mechanics; and Logarithms.

A BIBLIOGRAPHY ON CUTTING OF METALS. 561 pages, 5¾ by 8¾ inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, $6.50.

This bibliography on metal-cutting, which has been prepared by Orlan W. Boston, professor of metal processing at the University of Michigan, combines material previously published in 1931 and 1935 with 3500 additional items, arranged alphabetically by authors and chronologically by years, from 1864 to 1943, inclusive. The more than 4000 references in this work provide those interested in the subject with a comprehensive list of the most important articles on metal-cutting, including shaping, grinding, analysis and treatment of the various cutting tools; turning; milling; drilling; planing; shaping; broaching; and reaming, published during the years mentioned.

The testing of relays, contactors, and electronic devices is continuously carried on in this section of the engineering research laboratory of the Landis Tool Co., Waynesboro, Pa. A dust-free atmosphere, ideal for testing this equipment, is assured by a Westinghouse Precipitron electrostatic air cleaner in the main air duct of the air-conditioning system. Two return ceiling ducts are visible in the far corner. Though the installation has been in operation for more than a year, there is no evidence of discoloration due to air-borne dirt above the ceiling ducts

Classified Contents of This Number

Your Progress Depends Upon Your Knowledge of Your Industry